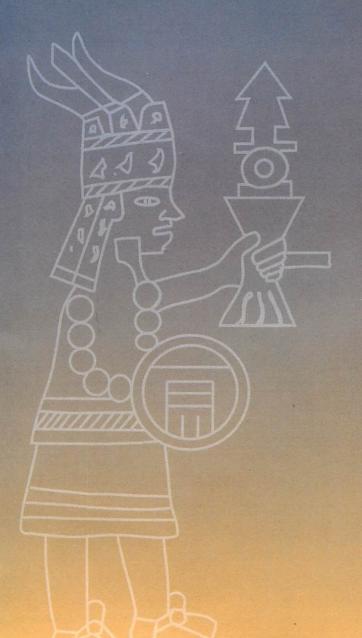
Global Forum Update on Research for Health 2005

Health Research to Achieve the Millennium Development Goals



Contents

Public health in the 21st century

Global policy making and health research leadership

Diseases and health determinants

Cross-cutting issues

Implementing health research

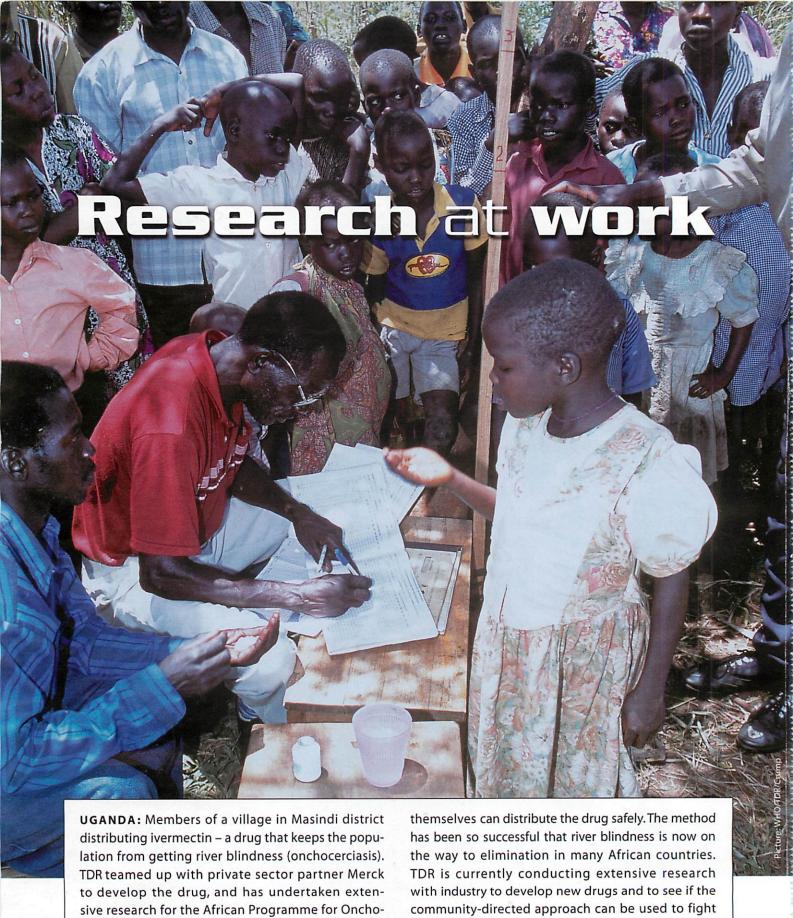
Global Forum Update on Research for Health 2005

Health Research to Achieve the Millennium Development Goals

Edited by Stephen Matlin

Pro-Brook London





TDR is a programme that funds and promotes international scientific collaboration. For almost 30 years, TDR has been fighting a wide range of diseases that primarily affect the poor. The Programme sets priorities in health research, identifies needs and opportunities, and acts on these through basic research, discovery research, implementation research, and research training in disease endemic countries.

cerciasis Control to establish how communities



other diseases.

TDR

UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases

Contents

- 7 Foreword Closing the gaps to achieve the Millennium Development Goals Richard G A Feachem
- 8 Introduction The Millennium Development Goals: substance and spirit Stephen A Matlin
- 13 The Global Forum for Health Research

17 PUBLIC HEALTH IN THE 21ST CENTURY

- 18 Research challenges for global health Ilona Kickbusch and Lea Payne
- 22 Health and the Millennium Development Goals Rebecca Dodd and Andrew Cassels
- 26 The double burden of disease and the global research agenda Colin Mathers
- 32 Improving public service delivery of healthcare Anne Mills
- 37 Building capacity for public health research Andrew Y Kitua

GLOBAL POLICY MAKING AND HEALTH RESEARCH

- 43 Canada: demonstrating national leadership for international health The Hon. Carolyn Bennett and the Canadian Global Health Research Initiative
- Closing the relevance-excellence gap in health research: the use of evidence in Mexican health reform The Hon. Julio Frenk, Felicia Marie Knaul and Octavio Gómez Dantés
- Health research, the MDGs and policy making in Mozambique The Hon. Francisco Ferreira Songane, Stijn Broecke and Xavier Modol
- Global health challenges: perspectives from the Fogarty International Center Sharon Hemond Hrynkow
- 60 Closing gaps to achieve the MDGs: roles a medical research council can play – Indian experience N K Ganguly and Lalit Kant
- Creating a culture of health research implementation: ZonMw in the Netherlands Sponsor's statement: ZonMw

- A new order in health and health research Francisco
 Becerra-Posada and Adolfo Martínez-Palomo
- 70 Health research and the Millennium Development Goals Gerald T Keusch
- 73 The case for mobilising new research behind the health Millennium Development Goals Mariam Claeson, Adam Wagstaff, Eduard R Bos, Phillip Hay and Jacques Baudouy
- 76 Affordable, essential new health technologies: a view from the Rockefeller Foundation Gordon Conway and Charles Gardner

79 DISEASES AND HEALTH DETERMINANTS

- 80 Communicable diseases: a research perspective Robert G Ridley
- 85 Fighting AIDS, TB and malaria the research imperative Richard G A Feachem
- 89 Chronic diseases: research and policy priorities Robert Beaglehole
- 93 Health research to address selected chronic disease risks Derek Yach
- 100 The economic aspects of diabetes care Sponsor's statement: Novo Nordisk
- Health research for cardiovascular disease in developing countries K Srinath Reddy
- 107 Child health: how can health research make a difference? Zulfiqar A Bhutta and Seema Lassi
- The current state of mental and neurological research Rachel Jenkins, Florence Baingana and Don Silberberg
- Health research for sexual and reproductive health
 Paul F A Van Look and Catherine d'Arcangues
- 122 Sexual violence Claudia Garcia-Moreno and Chen Reis
- Research on violence and injury prevention could save millions of lives every year Etienne G Krug and David R Meddings

PARTNERSHIPS FOR A HEALTHIER WORLD

Because medicines alone can't end a crisis.



At Pfizer, we believe solutions to the global HIV/AIDS crisis must involve innovative medicines and a stronger public health infrastructure in developing countries. Through our partnerships, we're working hard to be part of these solutions.

Medicine. Working with governments and nongovernmental organizations, Pfizer has made available more than 4 million doses of Diflucan, our anti-fungal medicine, free of charge to low-income HIV/AIDS patients in 22 of the most afflicted, least developed nations. Diflucan treats a number of fungal infections, including two opportunistic infections associated with HIV/AIDS—cryptococcal meningitis and esophageal candidiasis. Pfizer launched the program in South Africa in 2000 and our commitment has no dollar or time limits.

Infrastructure. The Diflucan Partnership has already trained more than 18,000 health professionals in over 15 countries to diagnose opportunistic fungal infections. Pfizer is also working in partnership with the Academic Alliance for AIDS Care and Prevention, the San Francisco AIDS Foundation, and Makerere University to develop a treatment and training institute in Kampala, Uganda. This facility will train medical personnel from throughout Africa in the latest standards of HIV/AIDS care, and will directly address the continent's pressing need for skilled medical professionals.

The Global Health Fellows program sends Pfizer colleagues from around the world to Latin America, Asia, Eastern Europe, and Africa. These dedicated doctors, scientists, nurses, and educators share their expertise and support nongovernmental organizations in delivering care and education to fight HIV/AIDS and other diseases.

These are just a few examples of how Pfizer works in partnership for a healthier world. We hope this approach will become a model for cooperation among national governments, nongovernmental organizations, and private industry.



www.pfizer.com

129 CROSS-CUTTING ISSUES

- 130 Health research, poverty and equity Timothy Evans, Alec Irwin and Jeanette Vega
- 135 Why health research needs to be more sensitive to sex and gender differences Lesley Doyal
- 138 Disabled people, science and technology and health research Gregor Wolbring
- 142 Ethics and health research for development: an essential combination Carel IJsselmuiden

147 IMPLEMENTING HEALTH RESEARCH

- 148 Health research priority setting and tracking financial resources Andres de Francisco, Abdul Ghaffar and Mary Anne Burke
- 152 Advancing healthcare through ehealth technology Sponsor's statement: Microsoft
- 155 Globalising innovation in healthcare technology Harvey E Bale
- 158 HIV/AIDS Time is of the essence... Sponsor's statement: DHL
- 161 The role of public-private partnerships in health research for development Roy Widdus
- 165 New drugs for neglected diseases: what will it take? Bernard Pécoul
- 169 A role for schools of public health in development Barry R Bloom
- 177 Capturing biotechnology's promise for developing world diseases Wendy Taylor
- 181 Advertisers and sponsors' list
- 182 Acknowledgements

The Global Forum Update on Research for Health 2005 is published for the Global Forum for Health Research by Pro-brook Publishing Limited.

Pro-Brook Publishing Alpha House 100 Borough High Street London SE1 1LB United Kingdom

Tel: +44 (0) 207 863 3350 Fax: +44 (0) 207 863 3351 Email: info@pro-brook.com

web: www.pro-brook.com

Copyright

Text © Global Forum for Health Research 2004 Volume © Pro-Brook Publishing Limited 2004

All rights are reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photo-copying, recording or otherwise without the permission of the Publisher.

The information contained in this publication is believed to be correct at the time of manufacture. Whilst every care has been taken to ensure that the information is accurate, the publisher and Global Forum for Health Research can accept no responsibility for any errors or omissions or for change to details given. The views expressed in this publication are not necessarily those of the publisher or the Global Forum for Health Forum.

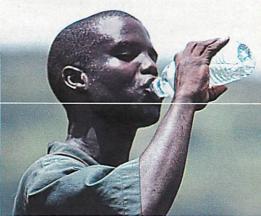
Application for reproduction should be made in writing to the publisher.

ISBN 2-940286-30-2

First published 2004

The Publisher and the Global Forum for Health Research thank the Fogarty International Center for their kind contribution to the cost of this Publication.









Using knowledge in the fight against poverty

Research provides the foundation for action towards poverty reduction and attainment of the Millennium Development Goals. Norway supports international health research through a number of initiatives, funds, networks and organizations. Norwegian institutions have a long tradition of research collaboration with partners in developing countries on international migration, global health, development and poverty reduction in the south.

Research cooperation and capacity development in research are not only of vital importance to countries and institutions in the South, they also give Norwegian research access to experience and materials that both enhance and challenge academic perspectives and provide favorable conditions for the development of new perspectives.

The Norwegian Agency for Development Cooperation (Norad) is a directorate under the Norwegian Ministry of Foreign Affairs (MFA). Its overarching aim is to contribute towards lasting improvements in economic, social and political conditions for the populations of developing countries, with particular emphasis on ensuring that development aid benefits the poorest people. Norad supports global health research through several collaboration programs, in particular the NUFU programme, the Fellowship Programme, and a new initiative in partnership with the Research Council of Norway.

Based on equal partnerships between institutions in Norway and in the South, the Norwegian Council for Higher Education's Programme for Development Research and Education (NUFU) is a Norwegian programme of academic research and educational cooperation. Its objective is to promote mutually beneficial co-operation based on priorities set by the institutions in the South. Universities, university colleges and research institutions in Norway co-operate with corresponding institutions in the South, primarily in Sub-Saharan Africa, but also in South East Asia, Central America and the Middle East.

The Norad Fellowship Programme provides scholarships for students from the South to study Master's and Diploma programmes in Norway, as well as in South Africa, Mozambique, Tanzania and Malawi. It is based on a vision that good educational opportunities at Norwegian universities and university colleges can contribute to increased competence in the South. Fieldwork is performed in the student's country or region.

The Research Council of Norway gives high priority to the internationalization of Norwegian research activities. In order to address the 10/90 research gap, a new program for global health research on poverty related health problems has been launched by the Research Council with financial contributions from the development cooperation budget (Norad) and the health budget (Ministry of Health).

The focus of the global health research programme will be on:

- New and more equitable methods for prevention, diagnosis, reatment and care of major poverty related diseases.
- Improved equity, quality and efficiency
 of the health care system through
 health systems research, research on
 health policy and research on structural and individual health determinants
 focusing on poor people in developing
 countries.

The Global Forum Update on Research for Health 2005

Closing the gaps to achieve the Millennium Development Goals



Article by Richard G A Feachem

ealth research has been immensely beneficial for human well-being, as witnessed by the contributions it has made to extending lifespan and quality of life for people in many countries in the last century. The new advances in biosciences, including genome mapping, genetic engineering, and nanotechnologies, hold great promise for further benefits to health - providing they are wisely and carefully applied.

But there is another side to the picture. People in many of the lower income countries - and, indeed, poor, disadvantaged and marginalised people everywhere in the world - have benefited less from the products of health research and continue to suffer high - and often growing levels of ill health and premature death. Many of the reasons for this can be traced to failures to use knowledge or to deliver products that are already available - which can be linked to issues such as inadequate finances, lack of political will, weak infrastructures and missing human resources. It is also clear, however, that further research is needed to tackle many of the health problems the world faces - problems that include the continuing presence of many infectious diseases, growing resistance to the available drugs, re-emergence of old infectious diseases that had been controlled, and emergence of new ones.

The appearance of more than 30 new infectious diseases for the first time in human beings since 1970 - an average of about one new disease a year - and the lessons drawn show that a strong health research capability remains a vital defence strategy. At the same time, there is a growing burden of non-communicable diseases, including cardiovascular disease, stroke, diabetes and cancers, in all regions and in many low- and middle-income countries (LMICs) these now account for more deaths and disability than communicable diseases. Added to this double burden, many LMICs are also experiencing dramatic rates of increase of road traffic injuries and of HIV/AIDS infections, making a quadruple burden.

Health research must continue not just to provide the technologies for treating or curing the consequences of these burdens, but must address prevention and must assist in understanding how services for diagnosis, treatment, support, and management can be organised and delivered effectively and efficiently in country-specific contexts and in resourcepoor settings.

The Millennium Development Goals (MDGs) represent a compact among the countries in the world to address gaps, inequities and imbalances across a range of sectors, including health. All of the MDGs are in some way health-related and achieving them, in the spirit as well as the letter, will require all-round improvements in health in every country - and many of these improvements are dependent on expanded health research that is better prioritised and more carefully

These crucial issues will be addressed by two complementary and partly joint meetings taking place in Mexico City on 16-20 November 2004. The Ministerial Summit organised by WHO and Forum 8, the annual meeting of the Global Forum for Health Research, will both be focused on 'Health Research for the Millennium Development Goals'. It is therefore particularly timely that this volume now appears, in which the Global Forum has collected articles providing the views and experiences of a wide range of experts and leading authorities on the global challenges in health research.

With the clock ticking steadily towards the 2015 deadline for many of the MDGs, and with the expanding threats of communicable and non-communicable diseases and injuries, it is to be hoped that these debates will lead to prompt, largescale and effective action.

Richard G A Feachem

Chair, Foundation Council Global Forum for Health Research Executive Director The Global Fund to fight AIDS, TB and Malaria

The Millennium Development Goals: substance and spirit



Article by Stephen A Matlin

he Millennium Development Goals (MDGs), set at the beginning of the 21st century (UN, 2000), represent the most important collective commitment ever made by developing and developed country governments, donors and international development agencies to tackle the poverty, ill health and deprivation suffered by a large proportion of the world's population.

The eight goals, backed by 18 targets and 48 indicators (see Table 1) have been widely criticised for their narrow scope and, paradoxically, for being both unrealistic in terms of time-scales, resources and capacities available and yet not going far enough towards redressing global inequities. Nevertheless, as the summation of international efforts in the 1990s to focus attention on the global priorities for development through a series of global conferences, and as the product of many complex negotiations to balance needs against obligations on all sides, the MDGs represent the best hope for galvanising global efforts in the decade ahead. This is especially true if the MDGs are viewed not just as a set of specific numerical targets but as the embodiment of a spirit of international commitment to fundamental principles of equity in development.

This is very much the spirit in which the Global Forum for Health Research views the MDGs. We see them not as list of individual targets to be ticked off when/if they are met, but as proxies for an overall concept of what development must mean if it is to improve the lives of poor people.

Improvement in health was long seen as an outcome of development - a beneficial effect for the individual that flows from decreasing poverty and increasing opportunities for more education and better living conditions. More recently, it has become widely accepted that better health is a necessary element of development and that investments in health have become essential to economic growth policies that seek to improve the lot of poor people (Global Forum for Health Research, 2004; WHO Ad Hoc Committee, 1996; WHO Commission, 2001; World Bank, 1993).

This utilitarian idea, that health is a factor that must be addressed for development to succeed, has been valuable in moving health towards the centre of development strategies during the last half century. However, it is also crucial to note that, during the same period of time, the position of health as a human right has been established in a number of international declarations and conventions. These have

helped to fully define the concept and affirm its application to all human beings, emphasising the inclusion of women, children, the disabled, migrants, refugees, displaced persons, and all ethnic, religious and social groups and minorities.

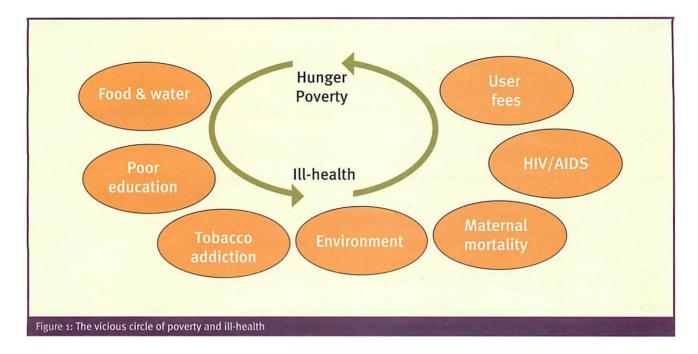
Placing the human right aspect of health at the forefront of discussions about achieving the MDGs is of vital importance. One over-arching concern about the nature of the goals stems from the fact that, for the most part, the MDG targets concern average improvements for large populations. Statistically, it is possible to achieve such targets by focusing efforts on the most easily reached groups or those for whom the least effort is required to gain advances, while neglecting the bottom fraction who are most in need or at risk (Gwatkin, 2002). Such an approach, while delivering the stated goals, would be contrary to the spirit in which they were constructed - that of closing the gaps between the better off and the poorest and most disadvantaged in our societies.

Consequently, the human rights perspective must be integral to all efforts to achieve the MDGs, reinforced by ensuring that the cross-cutting issues of poverty and equity are kept in sharp focus at all times.

Health and the MDGs

Three of the eight MDGs (Table 1: MDGs 4,5,6) specifically address major health issues relating to child mortality, maternal health and certain infectious diseases and the first goal, which includes reducing hunger as well as poverty, has an obvious correlation with improving health. Beyond this narrow interpretation, however, it is clear that every one of the eight MDGs has a significant health component, as demonstrated by the following brief examples:

There is a vicious circle linking poverty and ill health. Factors such as inadequate nutrition and access to clean water, poor education, tobacco addiction, and a poor environment can all contribute to ill health; as a consequence poor people are subject to higher rates of maternal mortality, HIV/AIDS and a host of other burdens that can have devastating consequences for themselves and their families. Out-of-pocket expenditures on health products and services, loss of productivity and earnings, burial expenses and some cultural approaches to the treatment of surviving family members following the death of a head of household can result in the total impoverishment and



disintegration of families units (Figure 1).

- Similarly, there is a well established relationship between educational level and health status. This is mediated in part by the obvious connections between higher educational achievement, a better job, improved standard of living and more resources to devote to healthcare and treatment. In addition, the education of girls, especially beyond the primary stage, results in large improvements in their own health and that of their families as a consequence of better knowledge and greater empowerment to seek and benefit from health services.
- Discrimination against girls and women is encountered in every field, including health, and is embedded in the gendered roles that males and females are assigned in every society. This leads to a poorer health status for girls and women in many developing countries and impacts not only on their reproductive health, which has often been the main or exclusive focus of attention in the past. All aspects of health, including susceptibilities to, diagnosis and treatment of and outcomes of diseases are highly gendered and mainly disadvantage girls and women (Doyal, 2002).
- Changing patterns in the use of land and environmental resources can have major consequences on the health of populations, and especially those living in or close to the margins of poverty. The changes may result in pollution, environmental degradation or dangerous work, as well as affecting the quality of water, sanitation and housing, all of which may have serious health impacts. Changes associated with mechanisation or industrial development can also affect the balance of resources within the family, often shifting the balance of control of income from women to men and leading to fewer resources being applied to nutrition and health.
- The impacts of increasing globalisation are diverse and mixed. Aspects such as the opening of markets to free trade with reductions in duties and tariffs, and the

imposition of tighter intellectual property restrictions may have negative consequences for the capacities of poor countries to sustain agricultural production, defend nascent industries and manufacture or import low-cost drugs. Impacts may include worsening inequalities within countries and declining levels of health.

The unfinished health research agenda

The last century has witnessed enormous improvements in human health. During this period, half of all the gains in life expectancy of the last several thousand years occurred. Two successive revolutions drove these improvements, the first being a transformation in public health resulting from new knowledge about the links between the environment, hygiene and disease, which led to improvements in the quality of water, sanitation and housing in industrialised countries. The second revolution, resulting from advances in sciences such as chemistry, biochemistry and medicine, was in the prevention, detection and treatment of diseases through the application of vaccines, diagnostics and drugs.

While there are now tools available to fight many diseases - and especially those that have been of importance to developed countries - the research agenda is by no means completed. In particular, very large numbers of people in the less developed countries derive little or no benefit from some of the tools so far created - either because the products are too costly to acquire or to administer in poorly developed and resourced health systems; or because products have not been created that would be predominantly or exclusively used in poor countries, even though this is where the vast majority of the world's population and the largest proportion of disease burden are to be found.

Health research is not simply about biomedical studies leading to the development of products such as vaccines and drugs. The spectrum of health research extends beyond this, to studies of the behaviour and performance of health systems and the nature of the policies that shape these

MDG	Goals and Targets	Indicators
Goal 1	Eradicate extreme poverty and hunger	1. Proportion of population below \$1 a day
Target 1	Halve, between 1990 and 2015, the proportion of people whose income is less than \$1 a day	Poverty gap ratio (incidence x depth of poverty) Share of poorest quintile in national consumption
Target 2	Halve, between 1990 and 2015, the proportion of people who suffer from hunger	Prevalence of underweight children (under 5 years of age) Proportion of population below minimum level of dietary energy consumption
Goal 2 Target 3	Achieve universal primary education Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	Net enrolment ratio in primary education Proportion of pupils starting grade 1 who reach grade 5 Literacy rate of 15 to 24-year olds
Goal 3	Promote gender equality and empower women	9. Ratio of girls to boys in primary, secondary and tertiary education
Target 4	Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015	Ratio of literate females to males among 15 to 24-year olds Share of women in wage employment in the non-agricultural sector Proportion of seats held by women in national parliament
Goal 4 Target 5	Reduce child mortality Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	Under-five mortality rate Infant mortality rate Proportion of one-year-old children immunized against measles
Goal 5 Target 6	Improve maternal health Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	16. Maternal mortality ratio 17. Proportion of births attended by skilled health personnel
Goal 6	Combat HIV/AIDS, malaria and other diseases	18. HIV prevalence among 15- to 24-year-old pregnant women
Target 7	Have halted by 2015 and begun to reverse the spread of HIV/AIDS	 Condom use rate of the contraceptive prevalence rate Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14
Target 8	Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	 Prevalence and death rates associated with malaria Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures Prevalence and death rates associated with tuberculosis Proportion of tuberculosis cases detected and cured under directly observed treatment short course (DOTS)
Goal 7	Ensure environmental sustainability	25. Proportion of land area covered by forest
Target 9	Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	 Ratio of area protected to maintain biological diversity to surface area Energy use per unit of GDP Carbon dioxide emissions (per capita) and consumption of ozone-depleting chloro-fluorocarbons
Target 10	Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	Proportion of population using solid fuels (proposed as an additional MDG indicator: not yet adopted) Proportion of population with sustainable access to an improved water source, urban and rural 1. Proportion of population with access to improved sanitation
Target 11	Have achieved, by 2020, a significant improvement in the lives of at least 100 million slum dwellers	32. Proportion of households with access to secure tenure
Goal 8	Develop a global partnership for development	
Target 12	Develop further an open, rule-based, predictable, non- discriminatory trading and financial system (includes a commitment to good governance, development, and poverty reduction – both nationally and internationally)	Some of the indicators listed below will be monitored separately for the least developed countries, Africa, landlocked countries, and small island developing states. Official development assistance 33. Net ODA total and to least developed countries, as a percentage of OECD/DAC donors gross income 34. Proportion of bilateral, sector-allocable ODA of OECD/DAC donors for basic social services (basic education, primary health care, nutrition, safe water, and sanitation) 35. Proportion of bilateral ODA of OECD/DAC donors that is untied 36. ODA received in landlocked countries as proportion of their GNI 37. ODA received in small island developing states as proportion of their GNI
Target 13	Address the special needs of the least developed countries (includes tariff-and quota-free access for exports, enhanced programme of debt relief for HIPC and cancellation of official bilateral debt, and more generous ODA for countries committed to poverty reduction)	Market access 38. Proportion of total developed country imports (excluding arms) from developing countries and least developed countries admitted free of duties 39. Average tariffs imposed by developed countries on agricultural products and clothing from developing countries
Target 14	Address the special needs of landlocked countries and small island developing states (through the Program of Action for the Sustainable Development of States and 22nd Congral Assembly provisions).	Agricultural support estimate for OECD countries as a percentage of their GDP Proportion of ODA provided to help build trade capacity
Target 15	States and 22nd General Assembly provisions) Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	Debt Sustainability 42. Total number of countries that have reached their HIPC decision points and completion points (cumulative) 43. Debt relief committed under HIPC initiative, US\$ 44. Debt service as a percentage of exports of goods and services
Target 16	In cooperation with developing countries, develop and implement strategies for decent and productive work for youth	45. Unemployment rate of 15- to 24-year-olds, male and female and total
Target 17	In cooperation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries	46. Proportion of population with access to affordable, essential drugs on a sustainable basis
Target 18	In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	47. Telephone lines and cellular subscribers per 100 population 48. (a) Personal computers in use and (b) internet users, each per 100 population

systems; and to social sciences and operational research to understand the determinants of health and the barriers that prevent effective delivery and inhibit access to and uptake of health services.

Biomedical research and the development of large scale manufacturing of safe, effective and quality-assured drugs and vaccines is an extremely expensive undertaking (estimates vary, but typically put the cost of developing a single new drug in the range of a few hundred million US dollars). It is largely carried out by pharmaceutical companies based in developed countries, where the costs of development are most readily recovered. On the other hand, health policy and systems research and social sciences and operational research require much more modest resources – which can be largely provided at the local level in the country concerned and with the availability of skilled human resources to conduct the studies being as critical a factor as the availability of financing for their work.

The estimate (Commission on Health Research for Development, 1990) that less than 10% of the world's resources for health research were being devoted to 90% of the world's health problems at the end of the 1980s, led to significant efforts in the 1990s to address the gross mismatch between resources for health research and the burdens of disease in developing countries – an imbalance that has become known as the '10/90 gap'. Notable developments have included:

- a substantial expansion (more than three-fold in a decade) in the overall level of global resources for health research, reflecting increasing investments by the public sector (especially the US National Institutes of Health), the private sector and the not-for-profit sector;
- the establishment of many new public-private partnerships to develop drugs, vaccines and diagnostics for neglected diseases and to improve access to these products;
- new sources of money to address neglected areas, such as the major initiatives of the Bill & Melinda Gates
- a widening recognition of the case for closing the gaps, strongly articulated by the Council for Health Research and Development (COHRED) established in 1993, the WHO Ad Hoc Committee (1996), the WHO Advisory Committee on Health Research (1997), the Global Forum for Health Research established in 1998, and the WHO Commission on Macroeconomics and Health (2001); and
- the establishment by the Global Forum for Health Research of a series of networks and initiatives to draw attention to and support areas of concern, including: the Alliance for Health Policy and Systems Research, the Child Health and Nutrition Initiative, the Global Network on Mental and Neurological Disorders, the Initiative on Cardiovascular Health in Developing Countries, the Initiative on Public-Private Partnerships for Health, the Road Traffic Injuries Network, and the Sexual Violence Research Initiative.

Since 1990, there have also been very significant developments on the scientific front, including: advances in

mapping genomes of different species; in technologies for manipulating atomic and molecular entities; in combinatorial technologies for screening vastly increased numbers of candidate drugs; and in genetically engineering and cloning cells to produce missing metabolites or correct physiological dysfunctions. These advances in 'biosciences' offer enormous potential for improving human health – and equally large challenges in ensuring that poor populations can benefit and that global health inequities do not grow even larger.

During this period, there have also been a number of extremely important changes in the landscape of global health. In particular, work by WHO to assess the global

These advances in 'biosciences' offer enormous potential for improving human health – and equally large challenges in ensuring that poor populations can benefit and that global health inequities do not grow even larger

burden of disease, first published in the mid-1990s and now providing an annual update through the statistical annexes to each year's *World Health Report*, has been of seminal importance in two ways: for the first time, it gave a clear picture of the nature and extent of burdens of disease, providing a number of surprises such as the degree to which injuries were a major source of morbidity and mortality; and also providing clear evidence of the changing patterns of disease and death in developing countries.

Among the changing patterns in developing countries, two are especially striking: the extent to which non-communicable diseases have emerged alongside communicable diseases as major health problems; and the impact of HIV/AIDS on the health, economies and development prospects of high-endemic countries.

These changing patterns of the burden of disease present a range of challenges for those engaged in prioritising, funding, directing and conducting health research to meet global and local health needs. Finding ways to increase overall health research resources and to make better use of existing ones are part of the picture; another part is concerned with gaining better insights into ways to improve the efficiency and effectiveness of health services and to increase access and uptake; yet another is to learn how to increase capacities at global, regional and local levels to cope with multiple disease burdens - it is common now to speak of the 'double burden' of disease in countries where non-communicable diseases have mushroomed but infectious diseases have not diminished, but in fact a number of countries are really experiencing a 'quadruple burden' with the additional and growing prominence of road traffic injuries and HIV/AIDS. The growth in burdens due to non-communicable diseases, injuries and HIV/AIDS all highlight the need for a shift in the health paradigm from treatment to prevention, and challenge the world to invent a new public health that will provide the framework for such an approach in the 21st century.

With the target date of 2015 for achieving the MDGs now little more than ten years ahead, there is growing concern that many of the goals will not be met (World Bank, 2003). There are numerous reasons why progress is too slow – including

failures by both the international community and individual governments to commit the resources and make the difficult changes in policies and practices that are essential to success – but the one which is highlighted here is the need for more health research across the whole spectrum, from product development to improvements in systems and services and in understanding and overcoming barriers to health improvement at national and local levels.

The Research for Health Update

The articles assembled in this publication have been commissioned from leading international experts to specifically address the health issues and challenges referred to above. They represent the views of many constituencies from high, middle and low income countries – Ministers of Health and other policy makers, officials in multilateral and bilateral agencies and not-for-profit foundations concerned with health and development, representatives of the private sector and public-private partnerships, and academics and leading figures in research institutions.

The Global Forum for Health Research is extremely grateful to all these contributors for their time and effort in developing clear, concise and authoritative overviews and perspectives on these critical topics. We would also like to acknowledge the many behind-the-scenes contributions from colleagues and collaborators who provided ideas and guidance – including Claudia Garcia-Moreno (WHO) and Chen Reis (Sexual Violence Research Initiative) who assisted with gender perspectives. We also thank Tim Probart and Trevor Brooker of Pro-Brook Publishing for the spirit of cooperation and concern for ethics and equity which has characterised the collaborative effort to produce this publication.

Stephen Matlin is Executive Director of the Global Forum for Health Research and a Senior Research Fellow at Oxford University. His former positions include Chief Education Adviser in the UK Department for International Development, Director of the Health and Education Departments in the Commonwealth Secretariat, London and Professor of Biological Chemistry, Warwick University, UK.

References

Doyal, L, 2002. Sex, gender and the 10/90 gap in health research. Global Forum for Health Research, Geneva.

Global Forum for Health Research, 2004. The 10/90 Report on Health Research 2003-2004. Global Forum for Health Research, Geneva.

Gwatkin, DR, 2002. Who would gain most from efforts to reach the millennium development goals for health? World Bank: Health, Nutrition and Population (HNP) Discussion Paper, ISBN 1-932126-59-7. The International Bank for Reconstruction and Development / The World Bank, Washington, DC.

UN, 2000. UN Millennium Declaration. Available at: www.developmentgoals.org

WHO Ad Hoc Committee on Health Research Relating to Future Intervention Options, 1996. Investing in Health Research and Development. World Health Organization, Geneva.

WHO Commission on Macroeconomics and Health, 2001. Report of the Commission on Macroeconomics and Health: *Investing in Health for Economic Development*. World Health Organization, Geneva.

World Bank, (1993). World Development Report 1993: Investing in Health. World Bank, Washington DC.

World Bank, (2003). The Millennium Development Goals for Health: Rising to the Challenges. World Bank, Washington DC.

The Global Forum for Health Research

he Global Forum for Health Research is an independent international foundation established since 1998 in Geneva, Switzerland. It works to promote more health research to combat the neglected diseases and conditions that are major sources of ill health in developing countries.

Health research encompasses a wide spectrum of activities that generate new knowledge and technologies - ranging from biomedical research that creates new drugs, vaccines and diagnostics, to health systems and policy research which ensures that health systems are better informed and managed, to social science and operational research to improve access and uptake and to help us better understand what affects the health and the choices of people in the community.

The Global Forum works to encourage all these aspects of health research to focus more on the health needs of poor, marginalised and disadvantaged people everywhere. It does this through advocacy, brokerage and catalytic roles and through serving as a generator and incubator of ideas and initiatives. This is often achieved by creating a platform for debate and by serving as a convenor of individuals and groups representing all types of interest in health research and its benefits. The annual Forum meeting has become a

Annual meetings

- 4 2002: Forum 6, Arusha, Tanzania
- 4 2003: Forum 7, Geneva, Switzerland
- ◆ 2004: Forum 8, Mexico City: Health research to achieve the Millennium Development Goals
- ◆ 2005: Forum 9, Mumbai, India, 12-16 September: Poverty, equity and health research]

The annual meetings provide the opportunity for groups to come together to explore how best to increase research into a particular problem area. As a result, the Global and networks, some of whom are already or on the way to becoming fully fledged independent entities.

Initiatives and networks

- Alliance for Health Policy and Systems Research www2.alliance-hpsr.org
- Global Network for Research in Mental and Neurological Health
- Initiative for Cardiovascular Health Research in Developing Countries www.ichealth.org
- Initiative on Child Health and Nutrition Research www.chnri.org (under construction)
- ♣ Initiative on Public-Private Partnerships for Health
- Road Traffic Injuries Research Initiative www.who.int/violence injury prevention/road traffic/en
- Sexual Violence Research Initiative www.who.int/gender/violence/sexviolresearch/en]

key gathering on the year's calendar, a meeting place for those who direct, prioritise, fund and carry out research. The meetings have proved successful in stimulating and facilitating dialogue and exchange between a very wide range of actors from all parts of the world, providing the opportunity for groups to come together to explore how best to increase research into a particular problem area.

In between meetings, we continue to work with partners on many of the themes that feature on the annual meeting programme. Key areas of work include priority setting, equity, gender, poverty, research capacity strengthening, and studying resource flows for health research and the relationship between resource flows and burden of disease.

The flagship, biennial 10/90 Report on Health Research has become a widely known and cited text and regular publications on resource flows are eagerly awaited. All our publications can be consulted or printed from our website. Paper copies are available free of charge. New titles are in preparation for early 2005.

Forum 8, Mexico City, 16-20 November 2004: Programme overview: health research to achieve the Millennium Development Goals

	Tuesday 16 November	Wednesday 17 November	Thursday 18 November
8.30-10.15	Registration	Joint Plenary: Forum 8 + Summit	Joint Plenary: Forum 8 + Summit
10.15-11.00		Break/Marketplace	Break/Marketplace
11.00-12.45		F8 Session 1 The 10/90 gap in health research and the MDGs: challenges	F8 Session 4 Maternal and child health
12.45-14.00		Lunch/Marketplace	Lunch/Marketplace
14.00-15.45		F8 Session 2 Poverty and equity	F8 Session 5 Health research on diseases and determinants
15.45-16.15		Break/Marketplace F8 Poster Session 1	Break/Marketplace F8 Poster Session 2
16.15-18.00	17.30-19.30 Joint Opening Session	F8 Session 3 Parallel sessions: Disability Environment 1 Equity Gender Intellectual property 1 Linking research policy and practice Mental health 1 Mobilizing social sciences Next generation researchers Poverty 1 Research capacity strengthening Sectoral roles Sexual and reproductive health Violence against women	F8 Session 6 Parallel sessions: Child health and nutrition Chronic diseases Ethics Evidence for action workshop Gender and health research Health and human resources HIV/AIDS Infectious diseases Intellectual property 2 Maternal and neonatal health Mental health 2 Poverty 2 Road traffic injuries Tanzania Essential Health Interventions Project
Evening	19.30 Joint Opening Reception	19.30 Global Forum hosts Joint Reception	18.30 F8 Session 7 Sessions by special arrangement Alliance for Health Policy and Systems Research Civil society organizations COHRED Commission on Macroeconomics and Health, Mexico Diabetes (Novo Nordisk) Drugs for Neglected Diseases Initiative G8 and health research Global Review on Access to Health Information Health + technology (Microsoft) Integrated Management of Childhood Illnesses Oral health REACH Road traffic injuries Violence against women in LAC

	Friday 19 November	Saturday 20 November
8.30-10.15	Joint Plenary: Forum 8 + Summit	Joint Plenary: Forum 8 + Summit Summit panel Presentation of Mexico Agenda Presentation of Forum 8 Statement
10.15-11.00	Break/Marketplace	Break/Marketplace
11.00-12.45	F8 Session 8 Resource flows and priority setting	Joint Session: Forum 8 + Summit Open dialogue
12.45-14.00	Lunch/Marketplace	Joint Closing Lunch
14.00-15.45	F8 Session 9 Networks and partnerships	m
15.45-16.15	Break/Marketplace F8 Poster Session 3	0
16.15-18.00	F8 Session 10 Parallel sessions: Accountability Beyond MDGs BIAS-FREE workshop Community-based methodologies Environment 2 Health financing Health information access Health systems Measurement tools Partnerships and regional fora Product-development partnerships Resource flows Trans-disciplinary research	
Evening	20.00 Mexico hosts Joint Gala Dinner	

New titles

- Global Forum Update on Research for Health
- ♣ Forum 8: a synthesis
- RealHealth -- a new e-magazine (and a quarterly paper version)]
- ♣ To order any of our publications
- ◆ To follow up on presentations at the annual meeting
- ◆ To send in an abstract for Forum 9
- ♣ To register for Forum 9 and join us in India next year
- ❖ To sign up for regular information bulletins from the Global Forum
- ♣ To receive RealHealth automatically by email

To be involved year-round in the work of the Global Forum for Health Research... visit our website

www.globalforumhealth.org



Public health in the 21st century

- 18 Research challenges for global health Ilona Kickbusch and Lea Payne
- 22 Health and the Millennium Development Goals Rebecca Dodd and Andrew Cassels
- 26 The double burden of disease and the global research agenda Colin Mathers
- 32 Improving public service delivery of healthcare Anne Mills
- 37 Building capacity for public health research Andrew Y Kitua

Research challenges for global health



Article by Ilona Kickbusch and Lea Payne

ne of the most cost-effective and achievable strategies to sustainable improvements in health is to provide access to information (Pakenham-Walsh et al, 1997). However, the majority of health professionals in developing countries are not much better informed than they were 10 years ago (Godlee et al, 2004), and levels of health literacy continue to be low in populations in poor countries (Kickbusch et al, 2002). This has impeded global efforts to meet the United Nations Millennium Development Goals (MDGs) and has stood in the way of one of the most important strategic goals of the Millennium Development Compact: involvement, participation and ownership. A recent analysis by the Global Governance Initiative of the World Economic Forum found that the world is only putting forth a third of the necessary effort to reach the MDGs, and it gave the world a score of four out of 10 for the direct health-related goals (World Economic Forum, 2004).

Reaching the MDGs is not just an issue of greater financial commitment among countries - outcomes also depend on new knowledge. Strengthening and refocusing health research must be seen as an essential and integral part of the MDG challenge and a crucial investment in health. But the problems facing health research remain significant. In this paper, we map out three groups of challenges: 1) strengthening the health research agenda for the developing world; 2) refocusing health research to address the MDGs; and 3) applying a global perspective to health research.

Strengthening the health research agenda for the developing world

The health problems facing poor nations receive much less attention than those affecting the developed world. The widely documented '10/90 gap' still persists, in which less than 10% of the US\$73 billion invested yearly in global health research is devoted to health problems that account for 90% of global disease burden (Global Forum for Health Research, 2004). Although a number of new research initiatives, such as the International AIDS Vaccine Initiative, have been created to address this gap, deteriorating health systems impede the conduction of health research at the level of the nation state.

As health inequities widen, research capacity in developing countries often remains weak (Sitthi-amorn and Somrongthong, 2000), due in part to the brain drain of health professionals. Even when funds are available, weak institutional capacity and the lack of critical mass of most institutions often hurt health research (Gonzalez-Block and Mills, 2003). Godlee et al. highlight lack of physical access to information, such as absent, slow or unreliable Internet connectivity, and prohibitively expensive paper and subscriptions, as the key barrier to knowledge-based health care in developing countries (Godlee et al, 2004).

Clearly, a more sustainable funding approach to academic institutions in developing countries is needed. Such support should explicitly help address the unequal balance between biomedical research and social, economic and political studies as well as the uncoordinated, siloed approach among disciplines. 'Health research is too often a fragmented, competitive, highly specialised, sectoral activity where researchers within scientific disciplines often work in isolation from other disciplines.' (Pang et al, 2003) Indeed, the major challenge will be to find mechanisms that address cross cutting and intersectoral issues, such as poverty and health, which are so crucial to developing world realities. This will only be achieved through new forms of inter and multidisciplinary research that are supported by new funding structures.

Refocusing health research to address the **MDGs**

Health research that benefits the poorest needs to be strengthened both within developed and developing societies in a coordinated effort. A recent report by the World Health Organization (WHO) asserted, 'There is urgent need to identify structures and means to translate knowledge into effective intervention. This will require the strategic development of new tools as well as delivery strategies that achieve effective and sustained coverage in diverse cultural and economic settings. It also may require new forms of interaction between the research, health service and macroeconomic policy makers." (World Health Organization, 2004a)

In light of the 2015 timeline of the MDGs, this challenge is key. Yet, the problem runs deeper. As articulated in the recent Interim Report on Task Force 4 on Child Health and Maternal Health of the Millennium Project, 'The new millennium requires new thinking about the relationship between health and development.' (Freedman et al, 2004a) The report calls for a shift in perspective and mindset that addresses the crucial distinction between two types of evidence: 1) an evidence-based understanding of the medical, behavioural or

public health interventions that successfully address the primary causes of child and maternal mortality and morbidity. and 2) an evidence-based understanding of and approach to the social, political, economic and institutional structures that enable societies - locally, nationally and globally - to ensure that all people have access to those interventions. This implies that the health research community needs to be able and willing to address the systemic obstacles faced by individuals, communities and countries in the pursuit of health. The Task Force report itself tries to take such an approach and stipulates that the power dynamics inherent in health systems have now become a primary obstacle to meeting the MDGs. Consequently, more research needs to be focused on access, utilisation, equity. 'The bulk of research funding in maternal health and child health should be devoted to research on the implementation of interventions proven to be effective, aimed at scaling up and ensuring access and utilisation in practice.' (Freedman et al., 2004b)

Two other key dimensions of MDG-related research should be prioritised: equity and accountability. First is the equity challenge, that is, to increasingly research 'what lies behind the averages', as expressed in the Task Force report. Not only do we need to sharpen our instruments for measuring and monitoring inequities, we also need research that traces the complexity of the equity issue in many countries (for example, indigenous health) and provides reliable information on the health impacts. Just as poverty has many faces, poor people usually have more than just one disease. Yet, there is very little research that takes these factors into account. The recent work that has linked hunger to HIV/AIDS (Food and Agriculture Organization, 2003) is an excellent example of the type of perspectives that are needed if we are to see the MDGs as an indivisible package in terms of both research and interventions. Second, more research is needed that documents the crucial importance of MDG 8 and traces the accountability of the developed world in the achievement of the MDGs. One recent example is the commitment to the Development Index developed by the Center for Global Development, which ranks 21 of the world's richest countries based on their commitment to policies that benefit the 5 billion people living in poorer nations (Ranking the Rich, 2004).

The components of this index describe the elements of a whole new crucial research agenda, as do the MDG Targets 12-18 that are used to measure progress with regard to Goal 8. The index brings together seven issues: aid, trade, investment, migration, environment, security and technology. Some first inroads have been made into this research agenda, such as Ron Labonte's examination of trade and health (Labonte, 2001) and Kelley Lee's research on the impacts of globalisation on the socio-economic-political context of health (Lee, 2003). Nevertheless, the global research community has far to go to fully understand the health impact of the larger driving forces of change on developing countries and poor populations.

Applying a global perspective to health research

The third set of research challenges relates to the rapid

changes the world has been undergoing in the context of globalisation. This relates not only to the impacts of globalisation on health and vice versa but also to the new global governance challenges that have arisen in the global health field. Too frequently we use the term global health without real consideration for its specificity: what is new, what is different, why is it important? The German sociologist Ulrich Beck has stated that we need to overcome 'methodological nationalism' (Beck, 2004), which refers to a perspective on problems that is constrained by the boundaries of the nation state and not yet ready to apply a global perspective. In the health field, the development of the global burden of disease methodology has been the first attempt at such a truly global perspective that transcends the national perspective.

From this global standpoint, a wide array of subject areas is opened up in health research for empirical, analytical and conceptual research. Increasingly, nation state boundaries can no longer circumscribe the unit of research but this obviously does not mean that all research is 'global'. Much of health research will be very local by exploring the impact of the driving forces of globalisation on health and its determinants at the level of cities, villages and communities. Such research is needed to allow policy makers to fully be able to assess the health of their own populations as well as health externalities of other policy decisions at home, abroad and at a global level, including transnational and cross border effects. This could include, for example, the study of:

- global health risks, such as Severe Acute Respiratory Syndrome (SARS) or Bovine Spongiform Encephalopathy (BSE/mad cow disease) in all its dimensions, including political and economic;
- global interdependencies in health, for example trade in health goods and services and the international movement of health personnel;
- mapping of global inequalities irrespective of nation state boundaries, for example in relation to gender or age;
- health of mobile and homeless populations, including migrants, refugees and displaced people;
- global influences on health everyday life, for instance the change in dietary patterns and the impact of global tobacco marketing;
- global-local interface, for example the interface between health, the global economy and rapid urbanisation and health; and
- global governance approaches and mechanisms, for instance an assessment of the new public private partnership mechanisms, the new financing instruments such as the Global Fund on AIDS, TB and Malaria, and the changing patterns of development aid.

Conceptual work is also necessary. More research needs to clarify, for example, the proposal to understand health as a global public good (Chen, Evans and Cash, 1999) or health as a key component of global security reference (Kickbusch, 2004). How do such new attempts at framing health and the international development agenda influence political commitment and financing? What difference do they make at the national and the local level? A key focus of global health

research must be global health governance and it must help in understanding the changes that are occurring among global health actors. Researchers should examine what exactly constitutes good governance for health and analyse the various types of governance that are appropriate to tackle specific health policy issues. Buse et al (2002), for example, emphasise the importance of exploring international versus global health policy; global-local health interface; new approaches, methods and tools for global health policy; cross-sectoral policy studies and global health governance.

The ethical challenge

As inequities in health grow, it becomes increasingly important to recognise that access to health knowledge is a right of global citizenship. The global public health community is charged with the responsibility to advance this principle of social justice. Moreover, global health research must adhere to ethical standards and not exploit vulnerable populations. The international clinical trials registry, for instance, that has been supported by WHO is a key step to this aim by not only aiming to improve dissemination of information and overcome publication bias, but also reducing unethical, unpublished research (World Health Organization, 2004b).

It is essential that the health sector and international organisations, in particular WHO, advocate for increased 'free access' and 'open access' to health information, especially among low and middle-income countries. National governments should support such efforts, for example, through building virtual health libraries on a regional basis, such as the BIREME initiative based in Latin American and the Caribbean (Godlee et al, 2004). Health knowledge as a right of global citizenship means that aid for health research in developing countries should not be considered as charitable handouts. Instead, the recipient countries must be regarded as contributing to a high quality networked global health research system that addresses difficult issues, like health and gender inequalities, infectious disease and social causes of illness (Lee and Mills, 2000).

Strengthening health research capacity and research systems is key for achieving equity. This strategy requires that national governments increase their health research budgets to at least 2% of their national health expenditures, and that international development agencies invest 5% of their health budget in health research and capacity building, as set forth in the 1990 Commission on Health Research for Development (Commission on Health Research for Development, 1990).

The creation of a Global Knowledge Observatory, as advocated by WHO, would provide great support to building national capacity. Such an organisation would act as a knowledge broker by supporting decision-making in government health departments of low and middle-income countries, especially those related to health system developments that are necessary to achieve the health-related MDGs (World Health Organization, 2004c). Simply strengthening health research capacity, however, is not sufficient. It is also essential to measure if and how the strengthening of research capacity actually leads to improved health equity.

Accepting health as a key factor of global citizenship also

means that business should invest in health research as part of corporate social responsibility. In particular, companies need to redirect their focus of health research towards neglected diseases and health problems plaguing the developing world. Only 16 of the 1393 new drugs marketed between 1975 and 1999 were for tropical diseases in the developing world (Pang et al, 2003). Yet, companies need incentives for the development of priority drugs, vaccines and diagnostics. The recent WHO draft report on 'Knowledge for Better Health' suggests that analysts might examine the 'feasibility of carefully designed tax relief schemes to pool patents/enabling technologies and make them available to public institutions and the private sector for commercial licensing for designated humanitarian use.' (World Health Organization, 2004d) Companies should also consider the health risks facing their employees inside and outside the workplace. In order to mitigate health risks for their workers, companies can share health information and best practices among their workforce as well as the wider community in which they operate. At the policy level, corporations can participate in the formulation of public policy that promotes health research. Businesses can also form partnerships for health research as a strategy to increase corporate citizenship.

Conclusion

The world must work harder to reach the Millennium Development Goals, and strengthening health research will aid in this process. The global health community must, on one hand, fortify international organisations (in particular the WHO) in a way that that allows them to fulfil new functions of health research in an interdependent world and, on the other hand, develop efficient forms of network governance for health research. Both strategies must intersect in forms of global accountability and financing that need to be developed and institutionalised.

Knowledge produced by health research must be seen as a global public good. (Global public goods are defined as having non-excludable, non-rival benefits that cut across borders, generations and populations.) (Kaul, Grunberg and Stern, 1999). The global public good concept implies that society must ensure the value of access to health knowledge and keep it as a priority on the global political agenda. As the main global health entity, WHO has a key role to play in ensuring global access to health information. First, WHO must provide leadership on this issue by attaching greater significance to the concept of health knowledge as a global public good. In a recent article in *The Lancet*, Godlee et al. (2004) call for WHO to champion the goal of 'Health Information for All', and outline the following strategies for WHO:

- 1) funding for research into barriers to use of information;
- 2) evaluation and replication of successful initiatives:
- 3) support for interdisciplinary networks, information cycles and communities of practice;
 - 4) formation of national policies on health information; and
- 5) networking and learning among stakeholders working to improve access to health information.

These strategies are imperative to reaching the Millennium Development Goals by 2015.

Governance of the health research realm itself also should be fortified. First and foremost, a coordination and leadership role in health research must be developed. 'No coordinating mechanism exists [at the international level] to bring together the diverse network of R&D investors and institutions to catalyse efforts and realise economies of scale (World Health Organization, 2004e).' This would be a fitting role for a consortium of agencies, research organisations and development organisations. Such a body could also help ensure health research looks beyond the biomedical model. The establishment of more partnerships and international networks for health research, coordinated and brokered in part by WHO, can address the current governance challenges in the health research realm. Networking has the potential to increase co-operation and decrease duplicated efforts among health researchers (Godlee et al., 2004). Networking must also extend beyond traditional health boundaries. Epidemiologists, for example, will have to establish closer links with other social scientists as well as policy makers to understand the complexities of policy making (Beaglehole and Bonita, 2004).

The most important challenge of all, of course, is translating health research into practice. The 'know-do' gap, which refers to the disconnection between what is known as best practice and what practitioners actually do, is a challenge in both developed and developing countries

(Godlee et al, 2004). This applies in particular to the knowledge on social determinants of health and research on equity and health. It also reflects the compartmentalised worlds of the producers of research and the end-users (such as the decision and policy makers, health professionals, consumers and the public) (Pang et al, 2003). It is here that the key challenge for the work of the Global Forum on Health Research lies.

□

Ilona Kickbusch is Professor for Global Health at Yale University, School of Medicine, Department of Epidemiology and Public Health. At present, she is on a leave of absence from Yale and is serving as a senior advisor on Millennium Development Goals and Health Targets to the Director of the Pan American Health Organization. Before joining Yale in 1998, she had a distinguished career with the World Health Organization and initiated the Ottawa Charter for Health Promotion, the WHO Healthy Cities project and other worldwide initiatives, such as health promoting schools.

Lea Payne MPH works as a freelance consultant in the global health field, with a particular focus on global health governance, health promotion policy and HIV/AIDS. Her clients include United Nations Development Program, Pfizer, Global Reporting Initiative, World Bank's Business Partners for Development and United Nations Association of the USA.

References

Beaglehole, R and Bonita, R. 2004. *Public Health at the Crossroads: Achievements and Prospects*, 2nd Edition, Cambridge University Press, Cambridge.

Beck, U. 2004. Der kosmopolitische Blick oder: Krieg ist Frieden. Frankfurt a.M. Suhrkamp Verlag,

Buse, K, Drager, N, Fustukian, S & Lee, K. 2002. 'Globalisation and health policy: trends and opportunities' in Lee, K, Buse, K, & Fustukian, S. (eds.) Health Policy in a Globalising World, Cambridge University Press, Cambridge.

Chen, L, Evans, T, Cash, R. 1999. 'Health as a Global Public Good' in Kaul, I, Grunberg, I and Stern, M. (eds.) *Global Public Goods: International Cooperation in the 21st Century*. UNDP, New York.

Commission on Health Research for Development. 1990. Health research: essential link to equity in development. New York: Oxford University Press.

Freedman, L, Wirth, M, Waldman, R, Chowdhury, M & Rosenfield, A. 2004a. Interim Report on Task Force 4 on Child Health and Maternal Health, Millennium Project, p. 7.

Freedman, L., Wirth, M., Waldman, R., Chowdhury, M. & Rosenfield, A. 2004b. *Interim Report on Task Force 4 on Child Health and Maternal Health*, Millennium Project, p. 67.

Food and Agriculture Organization. 2003. The State of Food Insecurity in the World 2003, Food and Agriculture Organization, Rome.

Global Forum for Health Research. 2004. The 10/90 Report on Health Research 2003-2004, Global Forum for Health Research, Geneva.

Godlee, F, Pakenham-Walsh, N, Ncayiyana, D, Cohen, B & Packer, A. 2004. 'Can we achieve health information for all by 2015?' *The Lancet*, Published online July 9, 2004 at http://image.thelancet.com/extras/04art6112web.pdf

Gonzalez Block, M & Mills. 2003. A. 'Assessing capacity for health policy and systems research in low and middle income countries,' *Health Research Policy and Systems*, Vol. 1 (1).

Kaul, I, Grunberg, I and Stern, M. (eds.) 1999. Global Public Goods: International Cooperation in the 21st Century, UNDP, New York.

Kickbusch, I, Caldwell, A & Hartwig, K. 2002. Health Literacy, Empowerment and HIV/AIDS: Striking a Balance on an Uneven Playing Field, July 2002, White Paper prepared for UNESCO, the US National Commission on Libraries and Information Science, and the National Forum on Information Literacy, for use at the Information Literacy Meeting of Experts, Prague, The Czech Republic.

Kickbusch, I. 2004. 'From charity to rights: proposal for five action areas of global health' *Journal of Epidemiology and Community Health*, Vol. 58 8), 630.

Labonte, R. 2001. 'Liberalisation, health and the World Trade Organization', Journal of Epidemiology and Community Health, Vol. 55: 620.

Lee, K. & Mills, A. 2000. 'Strengthening governance for global health research', *British Medial Journal*, Vol. 321: 775.

Lee, K. 2003. Globalization and Health: An Introduction. Palgrave Macmillian, Hampshire.

Pakenham-Walsh, N, Priestly, C & Smith, R. 'Meeting the information needs of health workers in developing countries', *British Medical Journal*, Vol. 314, 1997: 90.

Pang, T, Sadna, R, Hanney, S, Bhutta, Z, Hyder, A & Simon, J. 2003. 'Knowledge for Better Health – a conceptual framework and foundation for health research systems', *Bulletin of the World Health Organization*, 81 (11), p. 815.

'Ranking the Rich 2004', Foreign Policy, May/June 2004. Accessed at http://www.foreignpolicy.com/story/files/story2540.php, 1 August 2004.

Sitthi-amorn, C & Somrongthong, R. 2000. 'Strengthening health research capacity in developing countries: a critical element for achieving health equity', *British Medical Journal*, Vol. 321: 813.

World Economic Forum. 2004. 'Global Governance Initiative Executive Summary 2004', World Economic Forum, Geneva.

World Health Organization. 2004a. World Report on Knowledge for Better Health: Outline of Contents, World Health Organization, Geneva, p.2.

World Health Organization. 2004b. 'Draft: Report to the World Health Organization (WHO) on a Plan for International Registration of Controlled Trials', World Health Organization, Geneva.

World Health Organization. 2004c. Research Policy and Cooperation website, Meetings and Publications: Global Knowledge Observatory.

World Health Organization. 2004d. World Report on Knowledge for Better Health: Outline of Contents, World Health Organization, Geneva, p. 14.

World Health Organization. 2004e. World Report on Knowledge for Better Health: Outline of Contents, World Health Organization, Geneva, p. 4.

Health and the Millennium **Development Goals**



Article by Rebecca Dodd and Andrew Cassels (pictured)

n September 2000, the largest-ever gathering of Heads of State ushered in the new millennium by adopting the UN Millennium Declaration (United Nations Millennium Declaration, 2000). The Declaration, endorsed by 189 countries, was then translated into a road map setting out goals to be reached by 2015 (United Nations, 2002a).

The eight goals in the section on development and poverty eradication are known as the Millennium Development Goals (MDGs). They build on agreements made at major United Nations conferences of the 1990s and represent commitments to reduce poverty and hunger, to tackle illhealth, gender inequality, lack of education, lack of access to clean water and environmental degradation (see Box 1). The big difference from their predecessors is that rather than just setting targets for what developing countries aspire to achieve, the MDGs are framed as a compact which recognises the contribution that developed countries can make through fair trade, development assistance, debt relief, access to essential medicines and technology transfer. Without progress in these areas (summarised in goal 8), the poorest countries will face an uphill struggle to achieve goals 1-7. The notion of the MDGs as a compact between north and south was reaffirmed at the International Conference on Financing Development in Monterrey, Mexico, in 2002 (United Nations, 2002b).

Health and the MDGs

Three out of eight goals, eight of the 16 targets and 18 of the 48 indicators relate directly to health (see goals 4, 5 and 6). Health is also an important contributor to several other goals. For instance, ill-health can cause poverty through loss of income, catastrophic health expenses and orphanhood. Thus, improving health can make a substantial contribution to target 1, which aims to halve between 1990 and 2015 the proportion of people whose income is less than US\$1 a day. Similarly, there are also strong links from other goals to health: levels of girls' education, for example, have an influence on fertility rates.

The significance of the MDGs thus lies in their entirety: they should be understood as a mutually reinforcing framework to improve overall human development rather than as a set of individual targets. Equally, from a health perspective, the

Box 1: Millennium Development Goals focused on health

- 1 Eradicate extreme poverty and hunger
- 2 Achieve universal primary education
- 3 Promote gender equality and empower women
- 4 Reduce child mortality
- 5 Improve maternal health
- 6 Combat HIV/AIDS, malaria, and other diseases
- 7 Ensure environmental sustainability
- 8 Develop a global partnership for development

http://www.who.int/gb/ebwha/pdf files/EB111/eeb1113c 1.pdf for targets within each goal.

value of the MDGs does not lie in the setting of international goals. Rather, the MDGs provide a vision of development in which health (and education) are squarely at the centre. Since the adoption of the MDGs, no-one has been able to say that development is just about economic growth.

This is not to suggest that MDGs say everything that needs to be said about health and development. They are a kind of shorthand for some of the most important outcomes that development should achieve: fewer women dying in childbirth, more children surviving the early years of life, dealing with the catastrophe of HIV/AIDS, and making sure people have access to life-saving drugs.

In this sense, the MDGs represent desirable ends; they are not a prescription for the means by which those ends are to be achieved. They say nothing, for example, about the importance of effective health systems which are essential to the achievement of all health goals. The absence of reproductive health has been noted by many as one of the major gaps in the MDGs. Similarly, the MDGs focus on communicable diseases, yet non-communicable diseases and injuries contribute as much or more to the total burden of disease in many countries. In this regard, WHO has argued that an overall measure of mortality be included among the indicators of progress.

Current progress

A further important aspect of the MDGs is that they demonstrate, beyond any doubt, the need for urgent action to improve health.

With 1990 as the base year for the MDGs, we are now

Maternal death rates are 100 times higher in sub-Saharan than high-income countries. However, the good news is that outside this region, there has been some strong progress in increasing the rate of attended deliveries

more than halfway towards the 2015 target date. While some countries have made impressive gains and are 'on track', many more are falling behind. Progress is particularly slow in relation to child and maternal mortality and infectious diseases, especially in sub-Saharan Africa. In the case of under-five mortality, the developing world has managed only a 2.5% average annual rate of reduction during the 1990s, well short of the MDG target of 4.2% (World Health Organization and World Bank, 2003a). Figure 1 shows that all regions of the developing world, except Latin America and the Caribbean, are off-track to meet the under-five mortality goal and that sub-Saharan Africa is way off-track.

With more than more than 500,000 women a year dying in pregnancy and childbirth, faster progress on reducing maternal mortality remains a key challenge. Maternal death rates are 100 times higher in sub-Saharan than high-income countries. However, the good news is that outside this region, there has been some strong progress in increasing the rate of attended deliveries: for example, the percentage of deliveries with a skilled attendant rose by two-thirds in South-East Asia and North Africa between 1990 and 2000 (United Nations, 2004). It is likely that these regions would also show



Figure 2: The impacts of AIDs on life expectancy

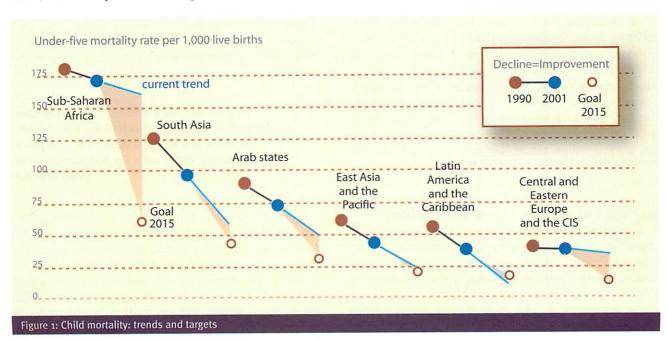
significant declines in maternal mortality if good data were to be available.

The global HIV/AIDS pandemic is affecting progress towards all MDGs, not just health. As Figure 2 shows, HIV/AIDS can reverse former health gains built up over years, and should therefore be treated differently from other aspects of international development.

Progress on goal 8 also lags far behind expectations. International consensus remains elusive on key issues such as fairer trade, broader and deeper debt relief and progress toward the United Nations target of 0.7% of GDP for development assistance. Developing country commitment to goals 1-7 may well start to wane unless richer countries begin to fulfil their side of the MDG bargain.

The research agenda

Whilst overall trends are clear, the international health research agenda can play an important role in generating new knowledge and information which, if properly targeted at policy- and decision-makers, could help countries accelerate progress towards the MDGs.



First, research can help to show disparities in the achievement of health goals in poor versus non-poor groups. The MDGs are expressed as national averages and the aggregate data which they generate may mask growing inequalities between socioeconomic groups. Thus, a country may 'achieve' the MDGs without significantly improving the health of its poorer population (Gwatkin, 2002.).

Second, there is a need for new (and cheaper) drugs, vaccines and diagnostics, in particular to help address the communicable disease burden. With 14,000 new HIV infections daily, and 300–500 million clinical cases of malaria each year, vaccines for these diseases would undoubtedly save many lives (World Health Organization, 2004a.). However, in the main, the problem is not one of technology. Countries are not 'off track' in their progress to achieve the MDGs because they do not know how to treat a child with pneumonia, prevent diarrhoea, deliver babies

In many countries – particularly in southern Africa – the shortage of health service and other public sector staff has now become one of the most serious rate-limiting factors in scaling up the response to HIV/AIDS

safely, or even prolong the life of people living with AIDS. Effective interventions exist; they just do not reach the people who need them most – the poor.

This brings us to the third area. Not enough is known about what works to reach the poor. This is not just a question of identifying the so-called 'diseases of the poor'. While it is true that the poor are hardest hit by HIV/AIDS, tuberculosis, malaria and other diseases, they are not exclusively affected by a set of 'lower class' illness. Rather, we need more evidence about how to tailor policies and systems to ensure that poor people have access to the benefits of health services, regardless of the diseases they are suffering from. Research can help to provide evidence of how to deliver effective and comprehensive health services in the poorer and more remote regions, something which most low-income countries do not do very successfully.

Research is most useful when it is linked to feasible, 'implementable' policy recommendations. International health researchers need to be clear about the relationship between research and policy change: when and why are decision makers influenced by research? Are the key factors to do with ownership (who is carrying out research?) or with the ways in which results are communicated? This will require greater collaboration and dialogue between policy-makers and the research community.

Building a knowledge base at country level

It is important that where possible, country-level research strengthens national systems and enhances country knowledge. Sound research and information is essential for tracking progress; evaluating impact; attributing change to different interventions; and guiding decisions on programme scope and focus. A key issue is that many different development partners – particularly those providing financial

resources – each impose their own research and monitoring demands on countries. These are largely designed to suit donor interest and reporting requirements, rather than to help countries make strategic decisions.

The result is that countries are overwhelmed and that fragile information systems are unable to cope. A recent high-level meeting on the health MDGs noted: 'We cannot count the dead in the vast majority of the world's poorest countries ... In sub-Saharan Africa fewer than 10 countries have vital registration systems that produce viable data ...' (World Health Organization and World Bank, 2003b). Within the 'metrics' community, there is a new focus on strengthening national systems through the Health Metrics Network – a coalition of countries, international agencies, bilateral and multilateral donors, foundations and technical experts that seeks to enhance country capacity to collect and use health data (World Health Organization, 2004b). For researchers, an equally important goal is make the results of research available and useful at country level.

What will it cost to reach the MDGs?

Current health spending in most low income countries is insufficient for the achievement of the health MDGs. We have global estimates of what is needed – a doubling of aid from US\$50 to US\$100 billion a year for the MDGs as a whole; US\$10 billion per year total spending on HIV/AIDS; and a fivefold increase in donor spending on health (World Health Organization and World Bank, 2003c.). Official development assistance has risen in recent years, from US\$49.5 billion in 2000 to US\$59.1 billion in 2002 (Faure, J-C. 2003), though it still falls far short of the estimates of need outlined above. Developing countries too have set their own target to increase health spending (e.g. to 15% of total government expenditure) (African Development Forum, 2001).

Whilst more money is essential, though, it is only part of the picture. Progress will equally depend on getting policies right; making the institutions that implement them function effectively; building health systems that work well and treat people fairly; generating demand for better and more accessible services; and – perhaps the most neglected factor of all – ensuring there are enough staff to do all the work that is required.

We have doubled estimates of what is needed – a doubling of aid from US\$ 50 to US\$ 100 billion a year for the MDGs as a whole; US\$ 10 billion per year total spending on HIV/AIDS; and a five-fold increase in donor spending on health

In many countries – particularly in southern Africa – the shortage of health service and other public sector staff has now become one of the most serious rate-limiting factors in scaling up the response to HIV/AIDS and other public health problems. The reasons for this crisis are multiple. Health workers are dying. They are leaving public service because the conditions are poor, and getting worse. They are migrating to countries within Africa that can pay more for their services.

or going further afield, to Europe. Whilst analyses of these issues abound (Stilwell et al, 2003 and 2004; Vujicic et al, 2003; World Health Organization and World Bank, 2003d; Joint learning Initiative, 2004), a concerted attempt to remedy the situation has so far been wanting.

In summary, achieving the health MDGs represents one of the greatest challenges in international development, not least because they include the goal of reversing the spread of HIV/AIDS. To this, we have to add the steep declines required in child and maternal mortality, where progress lags far behind aspirations in many parts of the world. Improving health outcomes will not be possible without major improvements in health delivery systems which, in turn, depend on changes in public sector management, new forms of engagement with the

private sector, as well as interventions well beyond the health sector itself. Moreover, improvements in health are essential if progress is to be made with the other MDGs, including the reduction of absolute poverty. Appropriate, targeted research, carried out with an eye to improving a country's knowledge base and informing policy change, can play an important role in all of these areas.

Andrew Cassels is Director of the Department of Millennium Development Goals, Health and Development Policy, World Health Organization, Geneva.

Rebecca Dodd also works in this Department.

References

African Development Forum. 2001. Abuja Declaration on HIV/AIDS, tuberculosis and other related infectious diseases. www.uneca.org/adf2000/Abuja%20Declaration.htm

Faure J-C. 2003. DAC Journal. *OECD Development Cooperation Report* 2002. Vol. 4, No. 1:Table 1.

Gwatkin D. 2002. Who would gain most from efforts to reach the MDGs for health? An enquiry into the possibility of progress that fails to reach the poor. Washington, DC, World Bank.

Joint learning Initiative. 2004. The Joint Learning Initiative website: www.globalhealthtrust.org

Stilwell B, Diallo K, Zurn P, Dal Poz MR, Adams O, Buchan J. (2003) 'Developing evidence based ethical policies on the migration of health workers: conceptual and practical challenges', *Human Resources for Health Journal* 1: 8. http://www.human-resources-health.com/home/

Stilwell B, Diallo K, Zurn P, Vujicic M, Adams O, Dal Poz M. 2004. 'Health workers and migration from low-resource countries—what can be done?' *Bulletin of the World Health Organization*, WHO, Geneva, (forthcoming).

United Nations. 2002a. Road map toward the implementation of the United Nations Millennium Declaration. United Nations, New York, (United Nations General Assembly Document A56/326).

United Nations. 2002b. Report of the International Conference on Financing for Development, Monterrey, Mexico, 18-22 March 2002. New York

United Nations. 2004. UN Department of Economic and Social Affairs, Statistics Division. Progress towards the Millennium Development Goals, 1990-2003. http://unstats.un.org/unsd/mi/mi_coverfinal.htm

United Nations Millennium Declaration. 2000. United Nations, New York. (United Nations General Assembly Resolution 55/2. http://www.un.org/millennium/declaration/ares552e.htm).

Vujicic M, Zurn P, Diallo K, Adams O, Dal Poz M. 2003. 'The role of wages in slowing the migration of health care professionals from developing countries', *Human Resources for Health Journal*, in the press. http://www.human-resources-health.com/home/

World Health Organization. 2004a. WHO-UNAIDS HIV Vaccine Initiative. http://www.who.int/vaccine_research/diseases/hiv/en/

World Health Organization. 2004b. Improving health information systems: Empowering local decision-makers. http://www.who.int/healthmetrics/en/

World Health Organization and World Bank. 2003a. *Overview of progress toward meeting the health MDGs*. Issue paper 1 for the High-Level Forum on the Health MDGs, Geneva, 8-9 January 2004. http://www.who.int/hdp/forum_docs/en/

World Health Organization and World Bank. 2003b. Monitoring the health MDGs. Issue paper 3 for the High-Level Forum on the Health MDGs, Geneva, 8-9 January 2004. http://www.who.int/hdp/forum_docs/en/

World Health Organization, World Bank. 2003c. Resources, aid effectiveness and harmonization. Issue paper 2 for the High-Level Forum on the Health MDGs, Geneva, 8-9 January 2004. http://www.who.int/hdp/forum_docs/en/

World Health Organization and World Bank. 2003d. *Improving health workforce performance*, Issue paper 4 for the High-Level Forum on the Health MDGs, Geneva, 8-9 January 2004. http://www.who.int/hdp/forum_docs/en/

The double burden of disease and the global research agenda



Article by Colin Mathers

he relative burden of premature mortality and disability for different disease, injury and risk factor causes is an important input to the assessment of priorities for health research (World Health Organization, 1996). In 1993 the Harvard School of Public Health, in collaboration with the World Bank and WHO, assessed the global burden of disease (GBD) (World Bank,1993; Murray and Lopez, 1996). This study was also used to identify causes of disease burden where current knowledge was inadequate to intervene, and hence to identify priorities for health research (World Health Organization, 1996). Aside from generating a comprehensive and consistent set of estimates of mortality and morbidity by age, sex and region, the GBD also introduced a new metric disability adjusted life year (DALY) - to quantify the burden of disease (see next section). The DALY combines years of life lost from premature death and years of life lived with disabilities in a single indicator allowing assessment of the total loss of health from different causes.

The DALY combines in one measure the time lived with disability and the time lost due to premature mortality, by extending the concept of potential years of life lost due to premature death (PYLL) to include equivalent years of 'healthy' life lost by virtue of being in states of poor health or disability. One DALY can be thought of as one lost year of 'healthy' life and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability (Murray, 1996).

DALYs for a disease or health condition are calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the years lost due to disability (YLD) for incident cases of the health condition. Years lived with disability are converted to equivalent (lost) full years of health using disability weight factors that reflect the severity of the disease on a scale from 0 (perfect health) to 1 (dead). The weights used in the GBD 2000 are listed in detail elsewhere (Mathers et al, 2003). Additionally, 3% time discounting and non-uniform age weights which give less weight to years lived at young and older ages are used in calculating standard DALYs as reported in recent World Health Reports (World Health Organization. 2004).

The World Health Organization has undertaken a new assessment of the GBD for 2002 and this is used to provide an overview of the main causes of burden of disease in

medium and low income countries and of major trends since 1990. The data sources and methods used in the GBD 2000 study are documented elsewhere (Mathers et al., 2003) and summary results for 14 regions of the world are published in the *World Health Report* (World Health Organization. 2004) and on the world wide web (www.who.int/evidence/bod). In this article, countries are divided into high income countries (essentially Western Europe, North America, Australia, New Zealand, Japan and a few countries in the Eastern Mediterranean) and low to middle income countries based on per capita gross domestic product.

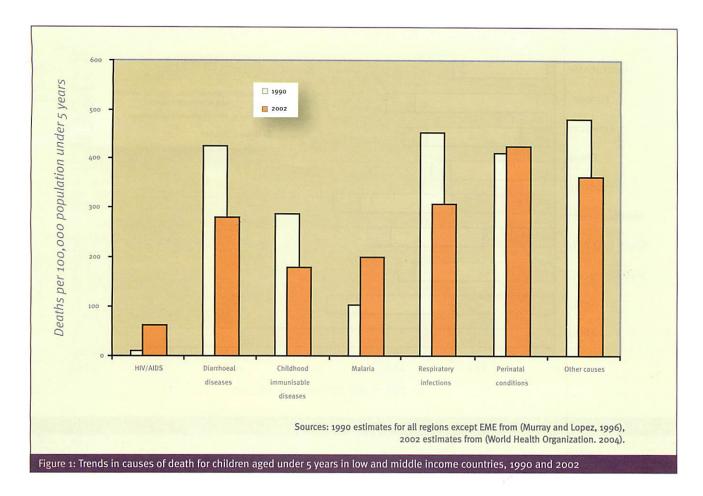
Mortality and causes of death

Almost 57 million people died in 2002, 10.5 million (or nearly 20%) of whom were children less than five years of age. Of these child deaths, 98% occurred in middle and low income countries. Over 80% of deaths in high income countries occur beyond age 60, compared to about 45% in middle and low income countries.

Although approximately 10.5 million children under five years still die every year in the world, enormous strides have been made since 1970 when over 17 million child deaths occurred. Today nearly all child deaths (97%) occur in low income countries, and almost half of them in Africa. While some African countries have made considerable strides in reducing child mortality, the majority of African children live in countries where the survival gains of the past have been wiped out or even reversed, largely as a result of the HIV/AIDS epidemic.

Communicable diseases still represent seven out of the top ten causes of child deaths, and cause about 60% of all child deaths. In Latin America and some Asian and Middle-Eastern countries, conditions arising in the perinatal period, including birth asphyxia, birth trauma and low birthweight have replaced infectious diseases as the leading cause of death and are now responsible for 21–36% of child deaths. Such a shift in the cause-of-death pattern has not occurred in Sub-Saharan Africa, where malaria, lower respiratory infections and diarrhoeal diseases continue to be the leading causes of death in children, accounting for 53% of all deaths. HIV/AIDS is now responsible for a little over 300,000 child deaths in sub-Saharan Africa and nearly 7% of all child deaths in the region.

Figure 1 compares the cause distribution of child deaths



under the age of five years in 1990 and in 2002 for low and middle income countries. Allowing for some uncertainty due to changes in data availability and methods, this figure shows broad improvements in child mortality due to diarrhoeal diseases, childhood immunisable diseases (particularly measles), and acute respiratory infections. While incidence is thought to have remained stable, global

While some African countries have made considerable strides in reducing child mortality, the majority of African children live in countries where the survival gains of the past have been wiped out or even reversed, largely as a result of the HIV/AIDS epidemic

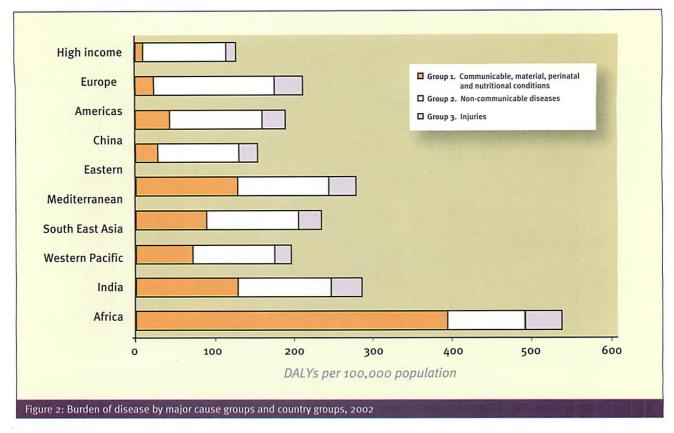
mortality from diarrhoeal diseases has fallen from 2.5 million deaths in 1990 to about 1.6 million deaths in 2001, now accounting for 13% of all child deaths under age 15. There has also been a modest decline in deaths from measles, although globally more than half a million children under five years still succumb to the disease every year. Malaria is causing over a million child deaths per year and rising to nearly 11% of all under five deaths.

Adult mortality rates have been declining in recent decades in most regions of the world. Life expectancy at age 15 has increased by between two and three years for most regions over the last 20 years. The notable exceptions are the high mortality countries in Africa, where life expectancy at age 15 has decreased by nearly seven years between 1980

and 2001, and the former Soviet countries of Eastern Europe. where life expectancy at age 15 has decreased over the same period by 4.2 years for males and 1.6 years for females.

Despite global trends of declining communicable disease burden in adults, HIV/AIDS has become the leading cause of mortality among adults aged 15-59, responsible for over 2 million deaths representing 13% of global deaths in this age group. HIV/AIDS deaths are responsible for the same proportion of deaths as ischaemic heart disease and cerebrovascular disease combined, and for more than twice as many deaths as road traffic accidents. Road traffic accidents are the fourth leading cause of death in adults aged 15–59 years, and three-quarters of these deaths are among men. Suicide and violence (homicide) are also among the top ten causes of death in adults aged 15-59 years. Together with war, intentional injuries account for nearly one in ten deaths in this age range globally.

The leading causes of mortality are very different in high income countries and other countries. While cardiovascular diseases, diabetes, chronic lung disease and four cancers dominate the leading causes in high income countries, accounting for almost 50% of all deaths, communicable diseases remain responsible for more than 50% of deaths in Sub-Saharan Africa. HIV/AIDS, tuberculosis and malaria together account for more than one in three deaths in Sub-Saharan Africa, and lower respiratory infections, measles and diarrhoea for another 20%. In most other low and middle countries, ischaemic heart disease cerebrovascular disease are among the leading three or four



causes of death, together with infectious and perinatal causes, and in some regions suicide and violence. These countries are experiencing a double burden of communicable diseases and diseases associated with poverty and underdevelopment, as well as of chronic non-communicable diseases associated with smoking, overnutrition, physical inactivity and other risks associated with development. Four of the top 10 causes of death in the world are related to smoking (ischaemic heart disease, stroke, chronic obstructive pulmonary disease and lung cancer). This is discussed further in the following sections.

Burden of disease

Lost years of full health per capita (as measured by the DALY)

are more than four times higher in Africa than in high income countries, and just over twice as high in India as in high income countries (see Figure 2). The peoples of Africa and India together bore almost one half of the total global burden of disease in 2002, though they comprise only one third of the global population. Loss of health due to communicable, maternal, perinatal conditions and nutritional deficiencies (Group I causes), the diseases characterising societies that have not gone through the epidemiological transition, continue to be responsible for almost 40% of the global burden of disease. Group I causes account for less than 6% of total disease burden in high income countries, but up to 70% in Africa, of which one quarter is due to HIV/AIDS.

Three neuropsychiatric disorders (depression, alcohol use

High income countries	6 total DALYs	Medium and low income countries	% total DALYs
1 Unipolar depressive disorders	8.9	1 Perinatal conditions*	7.0
2 Ischaemic heart disease	6.3	2 Acute respiratory infections	6.8
3 Cerebrovascular disease	4.8	3 HIV/AIDS	6.1
4 Alcohol use disorders	4.6	4 Diarrhoeal diseases	4.5
5 Alzheimer and other dementias	3.4	5 Unipolar depressive disorders	4.1
6 Hearing loss, adult onset	3.4	6 Ischaemic heart disease	3.7
7 Chronic obstructive pulmonary disease	3.3	7 Malaria	3.4
8 Trachea, bronchus, lung cancers	3.0	8 Cerebrovascular disease	3.2
9 Road traffic accidents	2.7	9 Road traffic accidents	2.6
10 Diabetes mellitus	2.6	10 Tuberculosis	2.5

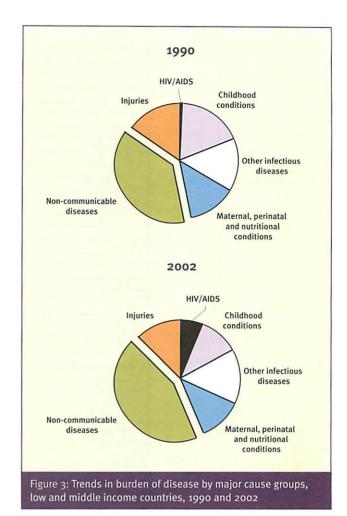
disorders and dementias) and two cardiovascular diseases. diabetes and chronic lung disease are among the ten leading causes of burden of disease in high income countries (see Table 1). Although infectious diseases are not major causes of burden of disease in high income countries, in middle and low income countries HIV/AIDS, malaria, diarrhoeal diseases, acute respiratory infections and tuberculosis are among the ten leading causes of burden of disease, accounting for just under one quarter of the total burden of disease in these countries. At the same time, ischaemic heart disease and stroke (cerebrovascular disease) are also among the top ten causes of burden of disease in low and middle income countries.

HIV/AIDS has risen from 0.8% of total disease burden in 1990 to account for nearly 6% of the burden of disease in 2002 (see Figure 3). The overall burden of communicable diseases has fallen somewhat since 1990, reflecting the improvements for measles, diarrhoeal diseases and some other infectious diseases. The overall burden of noncommunicable diseases has increased globally. Falls in the burden of cardiovascular diseases in high income countries reflecting improvements in risk factor control and in treatment, have been offset by increasing cardiovascular disease burden in middle income countries, reflecting population ageing and a transition from communicable to non-communicable diseases in countries undergoing the epidemiological transition.

The burden of non-communicable diseases is increasing, accounting for just over one half of the global burden of disease in 2002. It accounts for over 85% of burden in high income countries, but has also exceeded 60% in all other regions except India and Africa. Population ageing and changes in the distribution of risk factors have accelerated the epidemic of non-communicable disease in many developing countries. This is discussed further in the following section on risk factors.

Globally, neuropsychiatric conditions account for 10% of disease burden among adults, almost all of this resulting from non-fatal health outcomes. Unipolar depressive disorders are among the leading causes of burden of disease in all regions except Sub-Saharan Africa. The proportion of burden of disease attributable to cancer was 17% in high income countries and 5% in other regions in 2002. There were an estimated 1.2 million lung cancer deaths in 2002, an increase of nearly 30% in the 11 years from 1990, reflecting the emergence of the tobacco epidemic in low-income and middle-income countries.

Injuries accounted for 12% of burden of disease in the world in 2002. In the Eastern Mediterranean region and in low and middle income countries of Europe and the Americas, around 35 to 40% of the entire disease burden among male adults aged 15-44 is attributable to injuries. Globally, road traffic accidents are the second leading cause of burden in that age-sex group, preceded only by HIV/AIDS, and followed by depression. In high income countries, suicides account for the largest share of intentional injury burden whereas, in low and middle income countries, violence and war are the major sources. The former Soviet

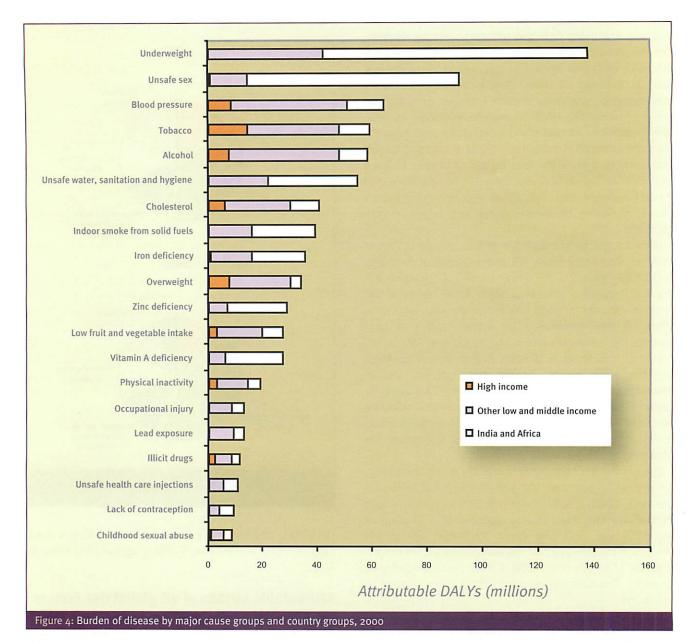


Union and other middle income countries of Europe have rates of injury burden among males approaching those in Africa.

Attributable burden of 26 global risk factors

The World Health Organization has recently undertaken a major analysis to provide reliable data on the mortality and burden of disease attributable to 26 major risk factors, across all regions of the world, using comparable methods and a common currency (the DALY) for health outcomes (World Health Organization, 2002; Ezzati et al., 2002). The regional distribution of burden of disease attributable to major risk factors is summarised here for high income countries and for low and middle income countries (see Figure 4).

Underweight due to malnutrition, and unsafe sex, followed by raised blood pressure, tobacco smoking and alcohol are the five leading global risks causing burden of disease in 2002 (see Figure 4). Risks are extraordinarily concentrated in low income countries, and relatively few risks are responsible for a considerable proportion of the burden of disease. For example, almost 15% of the total burden of disease in India and Africa is attributed to underweight with another substantial amount due to undernutrition. The burden from these risks alone exceeds that of the high income countries' entire disease and injury burden. Unsafe sex is the second leading risk in low and middle income countries, and in Africa accounts for almost one-fifth of the disease burden.



For high income countries, tobacco is the leading risk factor, accounting for 12% of the disease burden. Alcohol and blood pressure are responsible for 7–8% of healthy life years lost, with cholesterol and overweight accounting for 5–6%. Middle income countries now face a double burden of disease from risk factors and diseases of poverty and lack of development, as well as the chronic diseases associated with smoking, overweight, diet and physical inactivity.

Underweight, undernutrition, unsafe water and climate change affect children almost exclusively. The burden from addictive substances, unsafe sex, lack of contraception, risk factors for injury, unsafe injections and child sex abuse

We can conclude with some certainty that major causes of death and disability, such as tobacco and HIV/AIDS, are global pandemics and look set to rise further unless control programmes are more widely implemented

almost all occurs in middle-aged adults. Diet-related and environmental risks and unsafe sex are about equally distributed between the sexes, but four-fifths of the burden from addictive substances and 60–90% from occupational risks occurs among men. Women suffer most from child sex abuse and exclusively from lack of contraception.

Another major finding is the key role of nutrition in health worldwide. One-fifth of the global disease burden can be attributed to the effects of undernutrition. Almost as much again arises from diet-related factors such as high blood pressure, cholesterol, overweight and low fruit and vegetable intake.

Almost one half (47%) of deaths in the world in the year 2000 can be attributed to the 20 leading risk factors, when joint effects are taken into account. More than two-fifths (42%) of global deaths can be attributed to the leading 10 risk factors, and amost one third to the leading five risk factors. These leading five risk factors are responsible for one quarter of the total loss of healthy years of life globally.

The role of established risk factors is much greater than commonly thought, and the causes are known for more than

two-thirds of many major diseases, such as ischaemic heart disease, stroke, diabetes and HIV/AIDS. The potential is huge for improving health and reducing mortality through research to develop cost-effective interventions to reduce a relatively small number of risks.

Discussion and conclusions

This article has provided an overview of the disease and injury causes of mortality and burden of disease for high and low-to-middle income countries across the regions of the world. The contribution of 26 known risk factor causes to those outcomes is also summarised here. Burden of disease analysis provides a comprehensive, comparative overview of the state of population health, and the factors affecting the health of populations, and provides an important input to the assessment of health research priorities. The 2002 GBD Study, summarised here, is a much expanded effort compared to the original 1990 GBD study, with the incorporation of much new data and a greater understanding of the limitations of routinely available data sets.

Despite a continuing improvement in average health status in many developing countries, there are widening health inequities within countries, and some regions where health reversals have occurred. We can conclude with some certainty that major causes of death and disability, such as tobacco and HIV/AIDS, are global pandemics and look set to rise further unless control programmes are more widely implemented. Across the world, children are at higher risk of dving if they are poor and malnourished, and the gaps in mortality between the haves and the have-nots are widening. In some parts of the world, particularly in sub-Saharan

Africa, mortality declines have reversed. For example, overall, 35% of Africa's children are at higher risk of death than they were 10 years ago. Those that do make it past childhood are confronted with adult mortality rates that exceed those of 30 years ago. Indeed, the state of adult health is characterised by three major trends: slowing down of gains and widening health gaps, increasing complexity of the burden of disease, and the globalisation of adult health risks.

Until recently, major risk factors for chronic diseases such as blood pressure, cholesterol, tobacco, alcohol, obesity, and the diseases linked to them, had been thought to be the common in high income countries. But as the analyses reported here have shown, they are increasingly prevalent in middle income, and even low income, countries. They are now creating a double burden of disease in addition to the remaining unconquered infectious diseases that have always afflicted the lower income countries, and the still uncontrolled HIV/AIDS epidemic. It can be argued that these risk factors are part of a 'risk transition' showing marked changes in patterns of living, and in food processing and production, which pose long-term risks to the health of people living in low and middle income countries. Research to improve global health and to address the health gaps between low to middle income countries and high income countries must focus on the development of cost-effective prevention and treatment interventions for this double burden of disease and the associated risk exposures.

Colin Mathers works in the Evidence and Information for Policy (EIP) Division, World Health Organization, Geneva.

References

Ezzati M, Lopez A, Vander Hoorn S, Rodgers A, Murray CJL. 2002. 'Comparative Risk Assessment Collaborative Group: Selected major risk factors and global and regional burden of disease'. Lancet 360: 1347.

Mathers CD, Bernard C, Iburg KM, Inoue M, Ma Fat D, Shibuya K et al. 2003. Global Burden of Disease in 2002: data sources, methods and results. GPE Discussion Paper No. 54. World Health Organization, Geneva.

Murray CJL, 1996. Rethinking DALYs. In The Global Burden of Disease. Edited by Murray CJL, Lopez AD. Harvard University Press, Cambridge: 1.

Murray CJL, Lopez AD. 1996. The Global Burden of Disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020, Harvard University Press, Cambridge: 1st edn.

World Bank. 1993. World Development Report 1993. Investing in health. Oxford University Press for the World Bank, New York.

World Health Organization. 1996. Investing in health research and development. Report of the Ad Hoc Committee on Health Research Relating to Future Intervention Options. World Health Organization,

World Health Organization. 2002. World Health Report 2002. Reducing Risks, Promoting Healthy Life. World Health Organization, Geneva.

World Health Organization. 2004. World Health Report 2004: Changing History. World Health Organization, Geneva.

Improving public service delivery of healthcare



Article by Anne Mills

he last five years or so have seen some significant changes in international discussions of health system reform. In the mid to late 1990s, policies influenced by what was termed 'New Public Management' (NPM) approaches still appeared to hold sway (Mills 2000). The emphasis was on importing private sector management approaches into the public sector; downsizing the public sector and confining its role to policy and regulation rather than direct service provision; creating executive agencies and internal or quasi markets involving purchaser provider splits; contracting out services to the private sector; and charging users.

Since then, difficulties in implementing these types of reform, plus some lack of evidence of their benefits, has

Rather than dismissing public provision, we need to put more effort into identifying what factors are associated with better performance

encouraged a more nuanced discussion of their relative merits in different types of setting. It is increasingly accepted that reform blueprints are inappropriate, and that reforms must be adapted to the local context.

In a book written in the late 1990s, I commented that 'the international literature is in general remarkably thin in offering alternative models for health sector reform, with the battle lines drawn between those espousing NPM reforms and those supporting a traditional public sector monopolistic approach. Ideas are notably absent on how to reform what already exists rather than developing new forms of service delivery' (Mills, Bennett and Russell 2001).

This short paper follows up on this point. NPM-type reforms stimulated much thinking and research in areas such as contracting out, the role of the private sector, and regulation. However, issues concerning the functioning of the existing system of public services have not received enough attention and are of particular importance in the context of the service delivery improvements needed to make progress towards the health related Millennium Development Goals. This paper draws on research by my own research programme and others to suggest some

areas which deserve greater attention.

Improving public service provision

International health policy discussions commonly imply that public service provision is inevitably inefficient, inequitable, and poor quality. This then leads to the policy prescriptions of encouraging the private sector and contracting out service provision to the private sector.

However, the alternatives to public service delivery can also be inefficient, inequitable and of poor quality. The contracting literature demonstrates that contracting does not get round the problem of weak government capacity – capacity is required for managing contracting out, and for some services this may make greater demands on government capacity than direct service provision (Mills et al., 2001). While there is evidence that various strategies can improve the quality of private sector provision (Mills et al., 2002), these strategies can be demanding of skills and resources and are the hardest to apply to those private services most used by the poorest populations.

It has been suggested that 'despair over the incapacities of government may not be fully warranted' (Grindle, 2002). First, reasonable public services are often available to segments of populations, though often not those in urban slums or rural areas, so the issue is more one of how to encourage the public sector to reach the poor, than dismissing public provision as irrelevant. Secondly, many developing countries saw successful service expansion in the 1950s, 1960s, and 1970s, suggesting that governments have not always been incapable of providing more and better services to low income populations. Thirdly, there is some evidence of recent improvement in public service provision. Respondents in 20 developing countries, including some quite low income ones such as India, Indonesia, Nepal, Nigeria and Togo, were asked to rate government performance on various dimensions 'at the current time' (2000/1) and 'five years ago'. As can be seen in Table 1, on average performance had improved on all dimensions.

Rather than dismissing public provision, we need to put more effort into identifying what factors are associated with better performance and how public service delivery can be strengthened. But this is a research agenda that we have barely begun to address.

Human resources

This topic is very closely connected to the first, since we know that health worker behaviour is key to improved health service performance. As with public service delivery, it has become conventional to criticise the quality of care provided by public sector workers, but little attention has been given to how to improve performance. With a few exceptions, human resources seem to be treated as the central problem of health service performance, not as part of the solution.

Some recent interesting studies have begun to explore health worker motivation and influences on it, which hopefully in the future will lead to a better understanding of what policy levers might improve performance. Table 2 summarises some findings from a recent study in two Indian states (Brown, 2002). The first column shows factors workers said were important in an ideal job, and the second the factors causing dissatisfaction in the current job. Good income and employment benefits are important but not the most important either in an ideal job or as factors causing dissatisfaction. In both states, lack of opportunities to advance is a major cause of dissatisfaction, and in one state absence of training opportunities and in the other, time available for family. Rather then seeking to read too much into these rankings, perhaps the main point to be made is the differences between the states. It is very likely that motivation is highly context specific, requiring such studies to be done locally, and local action identified.

A study in South Africa, although not setting out to explore motivation systematically, sought to explore the work environment of private GPs contracted to provide public services (Gilson, Palmer and Schneider in the press). These GPs are vital service providers in small towns, but there had been a history of poor service quality and antagonistic relationships with the supervising provinces. The results (Table 3) highlight both the scope for building on the motivations of the GPs, and the problematic nature of the hierarchical relationships. For example, the majority of staff wanted to continue working where they were, liked their work, and felt they provided good quality services. However, they generally did not trust their supervisors, did not feel appreciated, and worried about losing their job. There was mutual dependence (Palmer and Mills, 2003) - GPs needed the public sector income to supplement private practice

'If you feel unhappy you can just tell them. You don't have to be afraid'

'We get it for free so we have no choice in the matter 'A white person always wins'

'They treat you according to class so the man that is really down there, he just accepts it'

'We have complaints but we just accept things as they are because there is nowhere else to go'

'I went to speak to one of the community leaders and he said he'll call a meeting. And what's happened since then? Nothing.'

Source: Schneider and Palmer 2002

Figure 1: Patient powerlessness

income; provinces had no other means of providing doctorbased care in these areas. Knowing the nature of the relationship, and the perceptions of both parties, is the first step to identifying what changes might improve service delivery. In this case, investment in greater communications and interaction appeared to be one way to improve relationships and service delivery.

We need to know more about how to address causes of poor health worker performance, both in terms of patient provider interaction and the various inputs required to make good performance possible. We also need to know more about how to make health service employment attractive in order to increase both recruitment and retention.

Accountability

Accountability is another important dimension of health system design. Accountability means holding individuals and organisations responsible for performance (Rakodi, 2002). It can be upward accountability, for example in the form of administrative accountability when district managers are accountable to their Ministry of Health headquarters for their performance; or political accountability as when civil servants are responsible to an elected body; or fiscal accountability in the spending of public revenues. Accountability can also be downwards, to citizens. Accountability is vital in a public service, yet is especially complex in health because of the role

Governance principles	Rating of performance 'five years ago'	Rating of current performance	Percentage change	
Participation	2.82	3.12	10.06	
Fairness	2.71	2.86	5.5	
Decency	2.82	3.10	9.9	
Accountability	2.52	2.70	7.1	
Transparency	2.66	2.87	7.8	
Efficiency	2.77	2.93	5.7	

Source: Court and Hyden 2001

Table 1: Perceptions of government performance

Job Factor	Factors importan	nt	Factors causing job	
	in an ideal job	(Rank order)	dissatisfaction*	(Rank order)
	UP (1)	AP (2)	UP (3)	AP (4)
Challenging work	3	9	8	
Training opportunities	5	4	1	9
Opportunities to advance	3		2	2
Good working relationships				
with colleagues	1	1		
Time for family	7	8	7	1
Good income	10	8	3	
Good employment benefits	4	5	5	
Good working location	9	6	3	7
Good physical working				
conditions	10	2	6	4
Tools to use skills on the job	2	5	4	6

Table 2: Key motivators and factors causing job dissatisfaction amongst health workers in Andhra Pradesh and Uttar Pradesh, 2000

of professionals. This can give the medical profession a degree of autonomy from upward accountability rules; it can also affect the extent to which citizens can realistically hold professionals accountable.

Current wisdom argues that strengthening the involvement of clients in service delivery is key to improving performance, and that hierarchical management controls need to be complemented with consumer influence through 'exit' or 'voice' approaches (Paul, 1992). Exit means choosing other service providers and is in practice what many people do

For example more attention needs to be paid to the potential role of civic organisations at national and local levels as intermediaries between providers and clients, and context specific research is required to identify the best approaches to strengthen accountability in particular settings

when they prefer to use private sources of care rather than public services. However, its impact on public providers is usually minimal because they do not suffer from exit - for example their budget is not reduced.

Voice involves providing information on entitlements and resources allocated and empowering citizens to organise to make demands. However, evidence suggests that strengthening voice can be very difficult. Research in Ghana, Zimbabwe, India and Sri Lanka found that patient exit to the private sector was common, and had little impact on public providers (Mills et al., 2001). Consumers were often the 'silent stakeholders' in healthcare reform: reforms focused on issues of organisation and management, to which people had little to contribute. Concerns to users, such as low quality, queues, informal charges and health worker attitudes were not visibly addressed by reforms.

As Grindle has also noted, reform is generally an elite process 'generated by the executive rather than by legislatures, political parties, interest groups or think tanks' (Grindle, 2000). Political engagement in reform is often weak, and in defence of existing interests and arrangements: producer interests tend to be more assertive than consumer interests.

The weakness of the consumer position is illustrated by the South African study referred to earlier. Most patients in the GP practices and also in public facilities neither knew who to complain to nor knew of community health committees that might have helped them (see Table 4). In focus group discussions with groups of women, there were a few positive comments, but generally, as illustrated in Figure 1, patients felt powerless to do anything about poor service.

Accountability is clearly vital to performance. But rather than just referring to the need for it, there should be more thinking on forms and methods of accountability that acknowledge the weak position of users vis-à-vis service providers. For example more attention needs to be paid to the potential role of civic organisations at national and local levels as intermediaries between providers and clients, and context specific research is required to identify the best approaches to strengthen accountability in particular settings.

Evidence for policy

Although the volume of health system research has been growing, there is still a quite notable lack of evidence on which policy makers can draw. Much of the health systems research literature is small scale, relying heavily on individual country case studies which make drawing conclusions relevant to a range of settings somewhat difficult. Moreover, studies cluster by country, with some countries quite well studied and others little studied. Table 5 summarises the results for Africa and Asia of a systematic search for literature in the English language on evidence of how to overcome constraints to improving health services delivery at the levels of household/community, health services delivery, and policy and strategic management (Oliveira-Cruz et al., 2003). While the uneven country and regional distribution is marked,

	Province 1	Province 2	
STAFF EXPERIENCES	n = 15	n = 10	
I like my work	67%	70%	
The quality of care is good	80%	80%	
I would rather be working elsewhere	27%	0%	
I trust my superiors	27%	30%	
My supervisors understand my needs	33%	20%	
If I work hard this is recognised by colleagues	67%	20%	
I worry about losing my job	67%	50%	
Patients appreciate our work	40%	100%	
Community members tend to abuse the services	100%	50%	

Source: Palmer, Sinanovic and McIntyre 2000, Sinanovic and Palmer 2000

Table 3: 1	Views of	contracted	GPs

	GPs Province 1	GPs Province 2	Public clinics
% patients not knowing who to complain to	89%	90%	>70%
% patients no opportunity to comment	84%	82%	68%
% patients unaware of community	89%	91%	89%
health committee			

Source: Palmer, Sinanovic and McIntyre 2000, Sinanovic and Palmer 2000

		A STATE OF THE PARTY OF THE PAR	
Table 4: Patient	complaints med	hanisms in	primary care

No of studies	Africa	Asia	
10	Tanzania		
9	Kenya	India	
7	Nigeria		
6		Nepal	
5	Ghana; South Africa		
4	Zimbabwe		
3	Cameroon; Uganda;		
	Zambia; Guinea	Bangladesh	
2	Burkina Faso; Egypt	Cambodia; China	
1	Benin; Burundi; Chad; Ethiopia;		
	Malawi; Mali; Niger; Senegal;	Korea; Philippines;	
	Guinea; Bissau; The Gambia; Zaire	Sri Lanka; Vietnam	

Source: Oliveira-Cruz, Hanson, Mills 2003

Table 5: Overcoming constraints to health service delivery: number of studies by region and country

it is also apparent that the number of studies is extremely small. Moreover, as highlighted in the review, the studies are extremely diverse, and methodologies often not very rigorous, making it difficult to draw firm conclusions.

Conclusions

This brief paper has sought to highlight the subject of improving public service delivery as deserving of greater attention, and suggested some issues of particular importance. To a considerable degree the problems of public service delivery are well known; what are not generally known are the approaches to improving service delivery that might work best. In the context of the need to expand considerably the coverage of health services in the poorest countries, this calls for a substantial effort on the part of governments to improve public service delivery, and closely related research programmes to study the effectiveness of different approaches and to feed findings into future service improvements.

Acknowledgements

This paper is a shortened and edited form of a paper presented to the conference 'What they talk less about in health care reform', Phuket, Thailand, 26-28 February 2003, which will be published in a book of the conference.

Anne Mills is Professor of Health Economics and Policy and Head of the London School of Hygiene and Tropical Medicine's Health Economics and Financing Programme, which receives a programme grant from the UK Department for International Development.

References

Brown K (2002). Improving organisational and individual performance for service delivery. How can officials become more responsive to the needs of the poor? Paper presented at DFID workshop on Improving service delivery in developing countries. Eynsham Hall, Oxfordshire, 24-30 Nov, 2002.

Court J and Hyden G (2001) Towards a world governance assessment: preliminary findings from the pilot phase. Working Paper. Tokyo: United Nations University.

Gilson L, Palmer L, Schneider H (in the press). Trust and respectful treatment: health worker performance in a South African study. Social Science and Medicine.

Grindle M (2000). Audacious reforms: institutional invention and democracy in Latin America. Baltimore and London: Johns Hopkins University Press.

Grindle M (2002). First in the queue? Mainstreaming the poor in service delivery. Paper presented at DFID workshop on Improving service delivery in developing countries. Eynsham Hall, Oxfordshire, 24-30 Nov, 2002.

Mills A (2000) Reforming health sectors: fashions, passions and common sense. In Mills A (ed) 2000. Reforming Health Sectors, London: Kegan

Mills A, Bennett S, and Russell S, with Attanayake N, Hongoro C, Muraleedharan V, and Smithson P (2001) The Challenge of Health Sector Reform: what must governments do? Oxford: Macmillan.

Mills A, Brugha, RF, Hanson K and McPake BI (2002). What can be done

about the private health sector in low-income countries? Bulletin of the World Health Organization 80(4): 325-330.

Oliveira-Cruz V, Hanson K and Mills A. (2003) Approaches to overcoming health systems constraints at the peripheral level: a review of the evidence. Special issue of the Journal of International Development 15(1),41-66.

Palmer N and Mills A (2003). 'We each do what we think is our duty' Classical versus institutional approaches to understanding controls on a contract with GPs in South Africa. Health Economics (in press)

Palmer N, Sinanovic E, and McIntyre D (2000). Primary health care contracting study. Western Cape district surgeons. Research Report, Health Economics Unit, University of Cape Town.

Paul S (1992). Accountability in Public Services: Exit, Voice and Control, World Development, 20 (7), 1047-1060.

Rakodi C (2002). What are the most effective strategies for understanding and channelling the preferences of services users to make public services more responsive? Paper presented at DFID workshop on Improving service delivery in developing countries. Eynsham Hall, Oxfordshire, 24-30 Nov,

Schneider H and Palmer N (2002) Getting to the truth? Researching user views of primary health care. Health Policy and Planning 17(1): 32-41

Sinanovic E, and Palmer N (2000). Primary health care contracting study. Eastern Cape district surgeons. Research Report, Health Economics Unit, University of Cape Town.

Building capacity for public health research



Article by Andrew Y Kitua

he developing world bears 90% of the global burden of disease (WHO Ad-Hoc Committee, 1996; Global Forum for Health Research, 2002), much of it in the tropical countries. Here the climatic and environmental conditions are most favourable for the survival and propagation of disease vectors and pathogens (bacteria, parasite or virus). These are the countries with the lowest economic status and often experience a vicious cycle of disease, poverty and more disease.

Africa bears the brunt of this unfortunate situation, contributing 90% of the 300-500 million annual malaria cases, and around a million child deaths each year. Except for leishmaniasis, the burden of the other tropical diseases like schistosomiasis, lymphatic filariasis, leprosy, tuberculosis, African trypanosomiasis, etc., are also greatest in Africa. Children are the most affected and the huge burden of childhood diseases demonstrates the grave situation in Africa (see Table 1).

In recent years, HIV/AIDS has spread like bush fire in Africa and is causing irreparable damage to the economical productive section of its populations.

In the case of available capacities for public health research, we find the reverse. About four-fifths of global working scientists of all disciplines, including health are concentrated in the Western industrialised nations, Japan and large Asian countries. Africa, Latin America and the Middle East have together 13% of the world's scientists. While Japan has one scientist for every 250 people, the ratio in many developing countries is one in thousands (WHO Ad-Hoc Committee, 1996). The developed/rich world, which only bears 10% of the global disease burden, has the lion's share of well trained scientists available globally and due to its better economic status continues to suck in further skilled people from the developing world, causing the brain drain phenomenon.

The core problem is the inequity in the distribution of the

Because of the absence of researchers capable of generating the evidence, policy-makers are unable to benefit from the much-needed evidence base for taking decisions about the use of alternative strategies for intervention or for planning healthcare services

capacity to generate public health knowledge, make it accessible and affordable to the needy and ensure adequate utilisation of current knowledge.

Therefore, while there is general agreement that there is a need for capacity building for public health research, this need is greatest in developing countries and for Africa it is a matter of urgency.

Consequences of the lack of capacity

Developing countries are not able to access the available global resources for health research due to:

- insufficient research capacities to compete for the funds;
- shortage of well-trained and competent scientists;
- lack of well-equipped laboratories adapted for high quality research and good practices;
- unfavourable conditions for access to funding by developing country scientists.

Lack of critical mass of scientists for R&D makes it hard for developing countries to use and implement effectively the available tools for improving their health status. Diarrhoeal diseases, intestinal worms and vaccinable diseases continue to spread even when tools and knowledge for their prevention are available, because of lack of capacity to translate the knowledge into action.

Because of the absence of researchers capable of generating the evidence, policy-makers are unable to benefit from the much-needed evidence base for taking decisions about the use of alternative strategies for intervention or for planning healthcare services (Nchinda TC, 2002).

Lack of scientific capacity is therefore greatly pronounced in poor developing countries. This exacerbates the vicious cycle of 'poverty - disease - poverty' through the following chain of

- Lack of scientists results in low generation and utilisation of knowledge.
- Low technology development and utilisation of current technology.
- Low level of competition for global health research funds.
- Lack of power to drive the global agenda.
- Poor and dilapidated facilities.
- Scientific frustration hence departure to better pastures.
- Heavy disease burden, low productivity and increase of poverty.

Condition	Burden (as % of total DALYs), 1990	
	World	Sub-Saharan Africa
Childhood communicable diseases		
Lower respiratory tract infections (pneumonia)	8.2	10.2
Diarrhoeal diseases	7.2	10.9
Vaccine-preventable childhood infections*	5.2	10.3
Malaria	2.3	9.2
Bacterial meningitis and meningococcaemia	0.5	0.3
Intestinal nematodes	0.4	0.2
Malnutrition (direct effects only)	3.7	3.2
Total burden from these conditions	27.5	44.3

*Diseases preventable with the vaccines currently available through the Expanded Programme on Immunisation: diphtheria, pertussis, tetanus, polio, measles.

Adopted from: WHO Ad-Hoc Committee, 1996

Table 1: The burden of childhood disease

- Limited technology transfer.
- Failure to implement and sustain health research programmes including disease interventions.

Causes of the problem at global level

The global agenda has for too long neglected the diseases affecting the poor populations. Malaria research has just started to receive its due recognition after decades of despair in the period 1960s and 1980s although it still receives comparatively low funding compared to the size of the problem. Michaud and Murray (1996) estimated that the global expenditure on research for HIV/AIDS and asthma was, respectively, US\$952 million and US\$143 million, whereas for malaria and tuberculosis it was about 15- and 5-fold less at US\$60 million and US\$26 million respectively. Taking cancer as an example, the UK expenditure is about

There is a glaring lack of strong training institutions for tropical medicine, low production of medical doctors and other scientists in biomedical fields

US\$225 million, equivalent to US\$1525 per single UK cancer death (Anderson et al., 1996). Malaria, on the contrary, has global expenditure of the order of US\$65 per single death, while it is responsible for a much higher death toll. Priority setting at the global level has not yet involved sufficiently for the developing world's voice to have a strong focus on the causes of the greater global burden.

The facilities for generating powerful scientists are lacking in the developing world due to historical reasons, and the tendency not to invest for the creation of infrastructure in the developing world is still a major stumbling block. Many funding agencies do not allow the inclusion of capacity building in developing countries in proposals seeking funds for public health research. It is difficult to persuade development agencies to allow for the inclusion of a research component when obviously the success of development projects depends on good data and monitoring processes.

There is a glaring lack of strong training institutions for tropical medicine, low production of medical doctors and other scientists in biomedical fields.

The brain drain from developing countries continues thrive, even when we are aware of the negative consequences and there are no policies to halt it.

Causes of the problem at regional level

At the regional level, there is lack of strong research advocacy and coordination. Such mechanisms either do not exist or, as in Africa, have just been started and are still struggling to get on their feet. A few developing countries like India, Brazil and China have moved faster forward, because they rectified this anomaly earlier on. Consequently, there is little advocacy for political support and financial support by regional economic bodies.

Funding mechanisms are lacking or poor, leading to little sense of ownership of the research agenda and of strategies for capacity building. It is not right that Africa has no common research funding mechanism similar to Europe or America. It is even unethical, given the huge disease burden.

Regional priority setting is absent and regions have little influence on the global agenda. Networking at the regional level is especially poor and uncoordinated in Africa, resulting in poor research output - unlike the PAHO region and India.

There is poor development of peer review systems, research monitoring and control bodies, leaving developing countries as sites to be used for sample and data collection for developed world laboratories, rather than being equal partners in research.

Causes of the problem at national levels

At the country level there is also weak research coordination,

advocacy and promotion, leading to poor quality or lack of research prioritisation. Only a few countries in Africa have well-functioning national health research mechanisms. The industrial base is lacking and product development efforts linking research and industry are rare. National guidelines for partnership are lacking and ethical review bodies are weak or inexistent. Research funding is negligible and mechanisms to facilitate research to implementation are missing.

Recommended strategic approaches to solve the problem

Global level:

- The setting of the global agenda should involve researchers from developing countries.
- Dialogue between northern and southern researchers should be formally conducted to make northern researchers understand the difficulties of southern researchers.
- Global legislation and regulations should be put in place, requiring compensation to developing countries whenever any of their scientists is taken up for employment in the developed world.
- Funding agencies should make it obligatory to have good capacity building in any research activity conducted in a developing country.
- Equal partnership in research should be emphasised and there should be equal treatment to northern and southern researchers when conducting collaborative research.
- The creation of strong and high quality laboratories in the south must be treated as a matter of urgency.
- Conditions should be put in place to encourage leadership and coordination by the south in collaborative research.
- Global funding mechanisms should network and create complementary funding programmes with long-term commitments to ensure adequate funding and integration into the health systems for sustainability.
- Negative competition should be discouraged. WHO has had a long-term, successful programme in Africa which has created good capacities. These efforts should be complemented by the creation of similar programmes targeting complementary capacities for other diseases and health conditions.

Regional level:

- Regional public health research coordination and promotion mechanisms should be created in developing countries.
- Research funding mechanisms at regional level should be set and be adequately supported by regional governments.

The Millennium Development Goals demand country actions and the actions of partners to provide assistance to poor countries. The goals do not require rich countries to solve the problems of the poor for them, but to help them solve their own problems. Charity does not work and is not sustainable

- Regional participation in global public health research should be enhanced.
- Regional networks should be created and coordinated by regional mechanisms for greater impact.
- The excellent and vast northern capacities for research should be harnessed to support capacity building in developing countries.

National level:

- Research coordination, promotion and monitoring mechanisms should be strengthened and national governments should provide more funding for research.
- Capacity strengthening at national level should be given priority and be strategically planned to fill in the major glaring gaps.
- Active creation of facilities for training and centres of excellence must be created. Partnerships with developing countries should be encouraged but guided by national and regional regulations, which prevent exploitation (Swiss Commission, 2001).
- Creation of facilities run and owned by the northern institutions in the south should be discouraged and existing ones should be run in partnership or integrated into country-owned systems.
- In addition to putting emphasis on research, countries must put in place effective plans to improve their health services and increase their capacity to absorb new interventions and scale them up at national level.
- Twining of laboratories and research institutions allowing for exchange of students and faculties should be encouraged.
- Inter country networking should be encouraged to enhance south-south collaboration.

Discussion

The world has set for itself the Millennium Development Goals and achieving them will require good information, evidence-based guidance on the implementation of effective interventions and continuous monitoring of more activities. Without a good base of scientific resources, this will not be possible even if resources are available. This provides an opportunity, to press for increased efforts in support of capacity building for public health research, to improve health status and reduce poverty.

The Millennium Development Goals demand country actions and the actions of partners to provide assistance to poor countries. The goals do not require rich countries to solve the problems of the poor for them, but to help them solve their own problems. Charity does not work and is not sustainable.

Globalisation is another opportunity, for uniting the world against the global problems and threats by disease and ill health. As Dr Pascoal Mocumbi put it 'Above all we need to think in radical new ways — ways that show we are more conscious of our common humanity in this third millennium. Ways that make the obligation to help our weakest members the rule and the priority, rather than the exception. And ways in which there is no longer any place for the 'my problem versus your problem' attitude that is still too prevalent in

The international community must recognise the inadequacy of public health research capacities especially in developing countries, to solve the increasing global disease burden

today's otherwise globalised world (Mocumbi, 2004).

The United Nations should take upon itself the responsibility of changing the global order and it is encouraging that this has been emphasised recently by world leaders, 'Global problems need global multilateral solutions and the United Nations is best equipped to lead us'. It should push for more debt relief and use of such relief to build national scientific capacities especially in public health research. It should urge rich countries to contribute generously to the Global Fund to Fight AIDS, TB and Malaria, which should be maintained and used not only for providing the goods but especially for enabling countries to generate knowledge, tools and capacities to utilise effectively the available public health goods. Emphasis should be on strengthening the weak health systems in poor countries so that they can introduce and scale up interventions effectively.

The international community must recognise the inadequacy of public health research capacities especially in developing countries, to solve the increasing global disease burden.

Hence funding for research affecting the majority of the world population who are poor must not only be increased but audited to ascertain that funds reach and are used in disease endemic countries. Direct channelling of funds to developing countries' institutions, instead of using intermediaries, will enhance capacity building for research management, coordination and accountability.

Current initiatives like the European-Developing Countries Clinical Research Partnership (EDCTP) should be encouraged.

Governments and regional organisations should provide the enabling environment for research through the enactment of appropriate policies that are relevant to research and product development. The lack of public health training facilities in disease endemic countries must be corrected and while endemic countries should take the lead, developed countries should help in providing technical and financial support.

Andrew Y Kitua has been Director General of the National Institute for Medical Research, Tanzania since 1998. He is a medical doctor (University Statale di Millano) and also has a PhD in Clinical Epidemiology (Basel University). From 1992-1998 he was Director of the Ifakara Health Research and Development Centre, Tanzania. He is currently a member of the Foundation Council of the Global Forum for Health Research 2000, and a member of the Scientific Advisory Committee of WHO/TDR.

References

Anderson J, Maclean M, and Davies C, 1996. Malaria Research. An audit of International activities. Unit for Policy Research in Science and Medicine. PRISM Report No. 7, September 1996..

Global Forum for Health Research, 2002. The 10/90 Report on Health Research 2001-2002. Global Forum for Health Research, Geneva .

Michaud C, Murray CCJL, 1996. Resources for health research and development in 1992; a global overview. In: WHO Ad-Hoc Committee, 1996. Investing In Health Research and Development. Report of the Ad-Hoc Committee on Health Research Relating to Future Intervention options. WHO, Geneva.

Mocumbi P, 2004. 'Plague of my People'. Nature 430: 925.

Nchinda TC, 2002. 'Research Capacity Strengthening in the South'. Social Science and Medicine 54: 1699-1711.

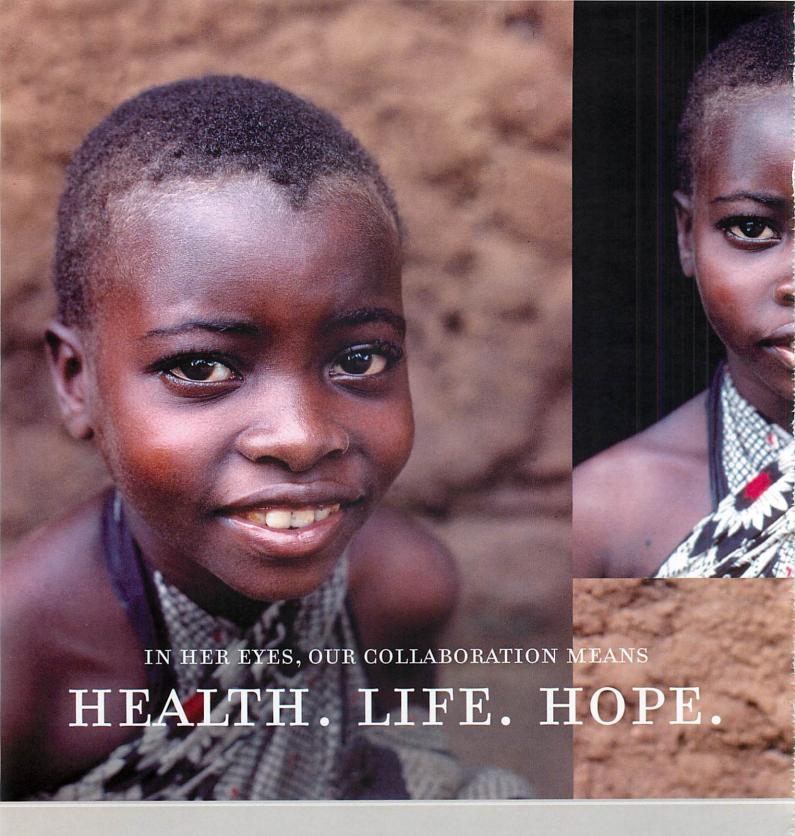
Swiss Commission for Research Partnerships with Developing Countries, 2001. Enhancing Research Capacity in Developing and Transition Countries. Experiences, discussions, strategies and tools for building research capacity and strengthening institutions in view of promoting research for sustainable development. Swiss Commission for Research Partnerships with Developing Countries KFPE 2001.

WHO Ad-Hoc Committee, 1996. Investing In Health Research and Development. Report of the Ad-Hoc Committee on Health Research Relating to Future Intervention options. WHO, Geneva.

Global policy making and health research leadership

- 43 Canada: demonstrating national leadership for international health The Hon. Carolyn Bennett and the Canadian Global Research Initiative
- 48 Closing the relevance-excellence gap in health research: the use of evidence in the Mexican health reform The Hon. Julio Frenk, Felicia Marie Knaul and Octavio Gómez Dantés
- Health research, the MDGs and policy making in
 Mozambique The Hon. Francisco Ferreira Songane,
 Stijn Broecke and Xavier Modol
- 58 Global health challenges: perspectives from the Fogarty International Center Sharon Hemond Hrynkow
- 60 Closing the gaps to achieve MDGs: roles a medical research council can play – Indian experience N K Ganguly and Lalit Kant
- 64 Creating a culture of health research implementation: ZonMw in the Netherlands Sponsor's statement: ZonMw
- 67 A new order in health and health research Francisco
 Becerra-Posada and Adolfo Martínez-Palomo
- 70 Health research and the Millennium Development Goals Gerald T Keusch
- 73 The case for mobilising new research behind the health Millennium Development Goals Mariam

 Claeson, Adam Wagstaff, Eduard R Bos, Phillip Hay and Jacques Baudouy
- 76 Affordable, essential new health technologies: a view from the Rockefeller Foundation Gordon Conway and Charles Gardner



BY HELPING TO REDUCE CHILD MORTALITY BY MORE THAN 40%,

the Tanzania Essential Health Interventions Project (TEHIP) has demonstrated how local solutions funded internationally can restore health, life and hope. A unique collaboration between Canada and Tanzania, TEHIP empowered two large districts with tools, strategies and modest funding increases. The improved local health systems mean thousands more children are living past their 5th birthday. To learn more about TEHIP, read Fixing Health Systems, a new book published by Canada's International Development Research Centre. The full text is available free online at www.idrc.ca/tehip.

For more information about TEHIP and other practical solutions made possible through Canadian development assistance, visit the web sites of the Canadian International Development Agency at www.cida.gc.ca. and the International Development Research Centre at www.idrc.ca.





Canada: demonstrating national leadership for international health



Article by The Honourable Carolyn Bennett and the Canadian Global Health Research Initiative

Nations in adopting the Millennium Development Goals as part of the road map for achieving the Millennium Declaration. These goals commit the international community to an expanded vision of development that vigorously promotes human development as the key to sustaining social and economic progress in all countries, and recognises the importance of creating a global partnership for development. A total of eight goals focus on: eradicating extreme poverty and hunger; achieving universal primary education; promoting gender equality and empowering women; reducing child mortality; improving maternal health; combating HIV/AIDS, malaria and other diseases; ensuring environmental sustainability; and developing a global partnership for development.

Canada is demonstrating international leadership through its support for national and international initiatives that respond to priorities in human development such as the Millennium Development Goals. In the battle against HIV/AIDS, for example, Canada is contributing CDN\$100 million to the World Health Organisation's '3 by 5' initiative, with a goal of providing three million people with HIV/AIDS access to antiretroviral therapy by 2005, and CDN\$70 million to the Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria. This year, Canada became the first country in the world to enact legislation allowing the export of more affordable versions of patented medicines to developing countries. These pharmaceuticals will meet the same rigorous standards for safety, efficacy and quality as those products available to Canadians.

Research is also critical to achieving these important goals. Canada has a world-class health research enterprise, both broad in scope and deep in expertise. University- and hospital-based health researchers from a range of disciplines work individually and in teams to address health issues of concern to Canadians and people around the world, supported through funding from federal and provincial governments, a strong network of health-related voluntary organisations, provincial health research agencies and the private sector (see Figure 1). Canadian research results are among our most important exports, taking new knowledge to where it is needed most

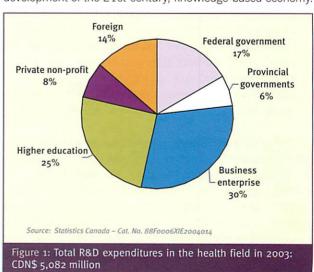
Last year's outbreak of SARS, which hit Canada's largest city of Toronto particularly hard, made clear the importance of

a global perspective in collectively addressing health priorities through research, policy and collective action. Canadians are also mindful of the '10/90 gap', the fact that only 10% of the US\$73.5 billion that was invested in health research worldwide in 1998 was allocated to the health problems of 90% of the world's population. For example, every year millions of people get sick and die from infectious and parasitic diseases for which old drugs are no longer effective, existing drugs aren't being made and new drugs aren't being developed – meanwhile, research efforts focus on areas such as erectile dysfunction and baldness.

Most of these health problems are concentrated in developing countries. It is the responsibility of the developed world, however, to help respond to these problems, through initiatives such as Canada's Global Health Research Initiative. This responsibility is based not only on our interest in helping all countries of the world maintain and strengthen the health of their populations but also on our own self-interest.

The Canadian health research enterprise

Since 1997, the Government of Canada has significantly increased its investments in health research (see Figure 2). It has done so in recognition of the important role of publicly funded research in improving the health, not only of Canadians, but of people around the world, strengthening our public health and health care systems and contributing to the development of the 21st-century, knowledge-based economy.



In the past several years, the Government of Canada has created the Canada Foundation for Innovation, which supports the development of cutting-edge infrastructure; the Canada Research Chairs programme, which supports the recruitment and retention of excellent researchers to address research priorities identified by universities; and Genome Canada, which funds research relating to genomics and proteomics. It has also continued its support of the Networks of Centres of Excellence Programme, which fosters partnerships among university, government and industry to improve the quality of life of Canadians while developing Canada's economy. And it conducts its own intramural health research through Health Canada, as well as departments such as Environment Canada and others.

The backbone of Government of Canada support for health research, however, is the Canadian Institutes of Health Research (CIHR).

This innovative organisation, created in 2000 and with a current annual budget of CDN\$ 662 million, takes a problem-based, multidisciplinary approach to health research that incorporates all areas of health research – from basic biomedical and clinical research, to research into health services and systems and population and public health. Its creation has transformed the way health research is conducted in Canada.

For example:

- its mandate is unique, in that it calls upon the agency to not only create new knowledge, but to translate the application of this knowledge into improved health, a strengthened healthcare system, and the availability of new products and services;
- ♣ its structure is also unique. Each of its 13 institutes addresses a domain of health research of immediate and identifiable importance. These Institutes break down geographic, institutional and disciplinary boundaries to bring together all partners in the research process, including researchers, funders of research, and users of research results, such as policy makers and practitioners, in pursuit of a common goal; and
- ➡ it has set a national health research agenda for Canada. Each Institute has identified its strategic priorities for the coming years, priorities that include such important areas as improving aboriginal peoples' health, obesity, financing healthcare, palliative care and the environmental and genetic determinants of disease in humans. Together, these priorities add up to an integrated, strategic approach to health research predicated upon achieving results for Canada and the global community.

CIHR also works across international boundaries to link with researchers in other countries who face similar challenges. For instance, Australia and New Zealand, like Canada, are working to improve the health of aboriginal peoples. CIHR has entered into an agreement with the national health research agencies of the two countries to support research that will improve the health of aboriginal peoples in all three countries. The agreement is founded on the basis that research must be undertaken on terms

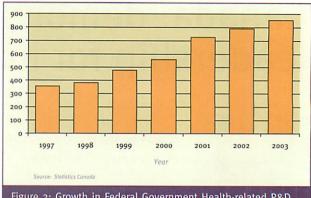


Figure 2: Growth in Federal Government Health-related R&D Expenditures, 1997 to 2003

acceptable to aboriginal peoples, allowing in particular for the protection of cultural knowledge and values, the participation of aboriginal people in research and research decision-making, and the promotion of aboriginal research by aboriginal researchers. In July 2004, the three councils together launched their first joint request for applications, focusing on identifying factors that promote resiliency and the foundations for good health throughout life.

Health research in Canada is a responsibility shared among the federal and provincial governments, the private sector and the voluntary sector. Canada is fortunate to possess a strong network of health-related voluntary organisations that fund research in areas such as heart disease, cancer and diabetes, while Canada's private sector, such as Canada's research-based pharmaceutical companies (Rx&D), invests a significant amount in health research each year.

As a result of this support, Canadian researchers have made important advances that are making a difference to the lives of Canadians and people around the world. Among their achievements are:

- a drug that is currently being studied as a treatment for cancer may also be effective in treating AIDS-related dementia. AIDS-related dementia affects 20% of people with AIDS and usually begins seven-to-ten years into the disease – meaning that as survival rates increase, more and more patients will experience dementia; and
- a vaginal gel containing the microbicide, sodium lauryl sulfate, that could give women a new method of preventing AIDS that is under their control. The gel is currently being tested on healthy young African women in Cameroon, Kenya, Benin and South Africa for its safety and its acceptability.

A public health system responding to emerging threats

Canadians learned first-hand from the SARS outbreak that the emergence of a new disease entity on the other side of the world is only an airline flight away from our own shores. The experience underscored to Canadians the importance of our public health system in responding to such threats.

SARS provides yet another example of Canadian health researchers working together to achieve important results. Canadian researchers sequenced the SARS genome in just 11 weeks. Following that success, the Canadian research

community came together to coordinate and fund research to develop both anti-SARS therapies and a vaccine. By the end of 2003, researchers in Canada had developed not one, but three vaccines ready for testing in animals. And a Toronto researcher had developed an effective treatment for the disease, combining steroids with interferon.

Canadian researchers are also examining and evaluating the public health and healthcare system's response to the SARS outbreak. The insights they gain will be applied in Canada and shared globally to help others cope with a similar outbreak.

But even though SARS did not reappear in Canada in the winter of 2003–04, we can be sure that there will be other, similar outbreaks of infectious disease that, no matter where they originate, will travel rapidly around the world, borne by the forces of globalisation and international travel. Strengthening of public health systems globally is a critical component of our national research and health and

Canadian researchers are also examining and evaluating the public health and healthcare system's response to the SARS outbreak. The insights they gain will be applied in Canada and shared globally to help others cope with a similar outbreak

development strategies, as Dr David Naylor noted in his report on the SARS outbreak in Canada (Naylor, 2003).

Canada is determined that its public health system will be ready for the next outbreak. To that end, we have created the Public Health Agency of Canada to take a national and coordinated approach to dealing with outbreaks of serious infectious diseases. The Agency is a key component of the CDN\$665 million investment the Government of Canada made in Budget 2004 and will work nationally and internationally in event of such an outbreak. The Agency will provide a centralised point for sharing Canada's expertise with the rest of the world and for applying international research and development to our own public health programmes and policies. It will take its place with partners at the global level, such as the World Health Organization, the US Centers for Disease Control and the European Community's public health organisation.

The work of the Agency will be complemented and supported by that of six National Collaborating Centres, each of which will champion key public health issues based on the particular strengths offered by different regions of our vast country. The six centres will focus on:

- determinants of health (Atlantic Canada);
- public policy and risk assessment (Quebec):
- infrastructure, info-structure and new tools development (Ontario):
- nfectious diseases (Prairies);
- red environmental health (British Columbia); and
- raboriginal health (British Columbia).

These National Collaborating Centres will build on existing strengths and create and foster linkages among researchers, the public health community and other stakeholders. They

will facilitate the sharing of knowledge and, most importantly, help to put knowledge into practice at all levels of the public health system across Canada.

Whether it is responding to outbreaks of infectious diseases or dealing with chronic public health problems such as obesity and tobacco use, Canada's Public Health Agency and its six National Collaborating Centres will help to ensure that Canada's public health system is, in the worlds of British Prime Minister Benjamin Disraeli, the foundation for the 'happiness of the people and the power of the country'.

The Global Health Research Initiative

The problems facing the developing world are well known. They include:

- crippling infectious diseases such as HIV/AIDS, tuberculosis and malaria, together with new global threats such as SARS and dramatic increases in chronic diseases;
- poverty, war and food insecurity;
- the growing gap in science and technology (S&T) capacity at both individual and societal levels, particularly in newer science platforms;
- she weakened health systems; and
- the continuing exodus of highly trained personnel, including healthcare managers, caregivers and researchers, from developing countries to the developed world.

For Canada, addressing these issues is a matter of self-interest, as well as of morality and equity. For Canadians, the opportunity to play a leading international role in closing the health gap between rich and developing nations could become a truly national objective. We know that much of the research conducted within our hospitals, universities and communities can have application in resource-poor countries. We also recognise, however, that developing countries need to be partners in research, not simply the target of export for research findings. Thus, one of the central ways that Canada is trying to address the '10/90 gap' is through the Global Health Research Initiative (GHRI). By engaging other countries as partners, their priorities for research will emerge and they will be more effectively addressed.

A key to achieving many of these goals will be using the GHRI to develop strategic partnerships to build and sustain capacity and improve health systems in lower- and middle-income countries (LMIC).

Partners in the GHRI, which was formalised in October 2001, are:

- CIHR:
- the International Development Research Centre (IDRC) a uniquely Canadian, non-profit agency to support research for development globally;
- the Canadian International Development Agency (CIDA) Canada's major public-sector development assistance agency; and
- Health Canada (the federal department of health).

The goal of the initiative is to develop practical solutions for the health and health care problems of the developing world. Many of these global solutions will provide valuable information on how to address these issues in Canada. Examples include providing high quality primary care for controlling epidemic diseases such as HIV/AIDS and preventive programming to reduce sexually transmitted diseases or policies to address domestic violence against women and children.

Canada is committed to helping these countries by sharing its expertise in its areas of strength – such as our particular

The Government of Canada places great importance on the GHRI as a uniquely Canadian contribution to global health research. 'This joint undertaking...will contribute to a great humanitarian cause – the health of citizens of all countries, including Canadians. This is the beginning; much more needs to be done

expertise in equity-based health systems, training, and enhancing the human resources aspects of the health system and the public health context for health systems. For instance, a recent examination of Canada's healthcare system commented that, 'Canada is in a strong position to take the lead in developing an international global network of health information. This type of network would contribute significantly to our global health knowledge base, help facilitate international co-operation and information sharing, support developing countries with limited health information capacity and help support improved health and health care outcomes over the longer term' (Romanow Commission, 2002).

The GHRI's role falls under three general categories: shaping and responding to the global health research agenda; influencing policy and policy coherence relating to global health research; and facilitating information sharing and the identification of complementary programmes among partner agencies. Activities can be divided into three broad areas:

- upstream research aimed at very fundamental determinants of global health status (such as global climate change, war, famine, HIV spread, migration, and economic globalisation) and effective 'healthy public policies' to address them;
- mid-stream research into practical tests and treatments, as well as preventive strategies, for major disease problems in LMIC settings, and the five risks factors (such as the global tobacco epidemic) that contribute to them; and
- downstream 'knowledge translation' research, into the actual application of such interventions, in terms of the provision of accessible, sustainable and affordable systems of health services, and health public policies, around the world.

Since its inception, the GHRI partnership has invested CDN \$7.9 million in new funding for global health research (see Figure 3). It has funded more than 70 teams of researchers from Canada and developing countries with pilot grants, as well as several two-to-four year grants. These grants represent

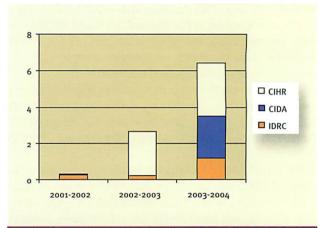


Figure 3: GHRI partner support for global health research funding programmes 2001-03

the first major investment in decades in joint health research involving Canada and lower- and middle-income countries. The funded researchers have begun work in dozens of settings on major global health problems, developing plans for long-term programmes of innovative health research spanning the globe. Among the excellent research projects being funded are:

- an examination of transforming violent gender relations to reduce the risk of HIV/AIDS among South African young women and girls;
- a study of women's participation in domestic violence health policy development; and
- the development of an international network to facilitate randomised clinical trials for priority health problems.

Collaborative research between the developed and the developing world has not always resulted in benefits to the lower- and middle-income countries involved. The GHRI is, therefore, explicitly guided by principles for ethical and effective global health research investments, to ensure that research serves the interests of all participants.

These principles are:

- research foci to be jointly determined by Canadian and LMIC partners;
- research foci to be supported by quantitative, evidencebased estimates of 'potential achievable reductions in population disease burden,' to ensure they reflect major, potentially remediable health/healthcare/health policy problems in the LMIC of the partnering team members and globally;
- full peer-review, to ensure scientific excellence;
- full ethical review, according to established international standards;
- attention to long-term training, LMIC capacity-building and sustainability, to ensure future LMIC capacity to continue to do ongoing research, in the longer term; and
- strong use of comprehensive evaluation frameworks for all grant-winning teams.

The Government of Canada places great importance on the GHRI as a uniquely Canadian contribution to global health

research. 'This joint undertaking...will contribute to a great humanitarian cause – the health of citizens of all countries, including Canadians. This is the beginning; much more needs to be done.' (Standing Senate Committee, 2002).

Conclusion

Historically, Canada has always been aware of its global responsibilities and of multilateral and bilateral approaches to addressing global challenges. The Government of Canada supports international collaborations such as the GHRI as a way to demonstrate health research leadership and contribute to the collective achievement of reducing global health disparities.

Helping nations wracked with poverty, war and crumbling institutions is, in the words of Canada's Prime Minister Paul Martin, a 'moral imperative'. The world's poorest countries cannot fight poverty if their citizens are debilitated by disease. We must do what we can to make medical treatment accessible to the untold millions suffering from deadly infectious diseases, notably HIV/AIDS, particularly in the poorest countries of Africa. And, as a knowledge-rich country, we must apply more of our research and science to help address the most pressing problems of developing countries.

The Government of Canada supports the GHRI as an effective part of Canada's international leadership in research, development and human security. We want to contribute to a world where the benefits of global interdependence are spread more fairly, thus alleviating hunger, poverty, illiteracy, gender disparities and disease. We recognise that much remains to be achieved. We are confident, however, that the actions we have taken to date to strengthen Canada's public health system while working collaboratively with countries around the world will help to lay the foundations for achieving the Millennium Development Goals and reducing the '10/90 gap'. \square

Carolyn Bennett was first elected to the House of Commons in the 1997 general election and was re-elected in 2000. In December 2003, she was appointed to the federal cabinet as Minister of State for Public Health. Prior to her election, Dr Bennett was a family physician in downtown Toronto, Ontario. She has had a strong interest in women's health and been an advocate for disabled persons, serving as Chair of the Parliamentary Subcommittee on the Status of Persons with Disabilities for a number of years. Dr Bennett is also author of Kill or Cure? How Canadians Can Remake their Health Care System, published in October 2000.

References

Naylor, D 2003. National Advisory Committee on SARS and Public Health: Learning From SARS – Renewal of Public Health in Canada.

Romanow Commission on the Future of Health Care in Canada. 2002. Building on Values: The Future of Health Care in Canada. Standing Senate Committee on Social Affairs, Science and Technology. 2002. The Health of Canadians – The Federal Role.

Closing the relevance-excellence gap in health research: the use of evidence in Mexican health reform



Article by The Honourable Julio Frenk (pictured), Felicia Marie Knaul and Octavio Gómez Dantés

ealth is one of the areas of greatest achievement in recent history. In few other fields has there been such a vast social transformation during the past 100 years. This transformation is expressed in two aspects: the improvement in the health conditions of populations and the development of differentiated institutions to respond to health problems.

There is substantial evidence that research and development were at the root of health progress during the 20th century and also that they hold the greatest promise for continued improvement in the future (Global Forum for Health Research, 2004; WHO, 1996). Yet this promise is threatened by persisting gaps in research and knowledge that often exacerbate rather than reduce the great health, economic and social disparities that persist within and among countries. Closing these gaps will generate a more effective use of research to advance the cause of equitable health development at the global and national levels.

Health research has been haunted by a series of false dilemmas. One of the dichotomies that has generated intense debate is the distinction between relevance and excellence in the production of knowledge. Another is the false dilemma that has been presented between global and specific or national research. Much false debate stems from a conceptual confusion between the production and the utilisation of research. This has led to important cleavages among groups of health researchers, which have greatly diminished their collective effectiveness in securing adequate interest from investors and sufficient use of the knowledge produced from research.

This paper analyses the nature of research gaps with a particular focus on ensuring a synthesis of relevance and excellence. We begin by analysing research gaps, focusing on the production, reproduction and utilisation of knowledge. Next we briefly consider the challenges in integrating excellence and relevance. Finally, we discuss how evidence and information on health spending and financial protection were used in designing, advocating and implementing the Mexican health reforms of 2003. This constitutes an example of a recent and effective effort to close the gap between research and policy making. We also present the Mexican

experience with integrating global research into the construction of a national evidence base for reform.

Gaps in health research

In order to achieve a comprehensive view, it is convenient to identify all the possible gaps that hinder the development of health research. These can be organised into four aspects of knowledge - its conceptual foundation, production, reproduction and utilisation.

The development of a sound conceptual foundation for health knowledge has been hampered by diverging ways of understanding and practising different types of health research. A possible solution lies in developing a balanced view that will make it possible to overcome false dichotomies. It is especially important to achieve a deep appreciation for the diversity of disciplines, levels of analysis, and methods that contribute to a comprehensive understanding of health. The complexity of health can only be grasped by abandoning reductionist positions.

One of the dichotomies that has generated intense debate is the distinction between country-specific and global research. A large part of the debate stems from a conceptual confusion between the production and the utilization of research. There is widespread agreement that the most important users of research operate at the national level. These users of research benefit not only from locally produced knowledge, but also from research that is produced elsewhere or that is generated through a global mechanism (e.g., systematic comparisons of national experiences). Conversely, decision makers at the global level utilise research that is nationally produced.

It is not sufficient to produce knowledge. It is also necessary to reproduce it. This is achieved through two major strategies: training of future researchers and aggregation and dissemination of research results through clearing houses and publications, so as to sustain a process of shared learning across countries and avoid inefficient repetition of efforts. For better production and reproduction of knowledge, it is necessary to stimulate institutional development, through three strategies: capacity building, capacity strengthening and performance enhancement.

The final set of gaps relates to the utilisation of knowledge. Research faces the challenge of balancing the requirements of excellence in the strict adherence to the norms of scientific inquiry with the demands for relevance to the solution of problems. In order to do so, the research enterprise must include explicit efforts to assure the transfer of knowledge to: product developers in order to generate better interventions; decision makers, in order to inform policy and management choices; and, the population at large, in order to provide the foundation for health-promoting behaviour.

The balance of relevance and excellence

The relevance-excellence gap between research and policy making is of particular concern because it generates an under-utilisation of knowledge by decision makers and limits the power of ideas-shape the ideas of power. In turn, inadequate use of research in decision making leads to reduced support for research and less scientific production, which completes the vicious cycle that causes low utilisation of research. The nature and solutions to this gap are explored in a more general framework in Frenk (1992).

In addition to the intrinsic value of generating new knowledge, research can be seen as an effort to close the gaps between the present conditions and the aspirations of humans. Thus, the ultimate value of research for decision-making is its relevance to identifying and satisfying the real and legitimate needs of the population. Under-utilisation of research implies reducing the capacity to meet these needs. This is particularly worrisome in the face of the explosion of scientific activity and knowledge with such great potential to contribute to human and economic development.

No matter whether one conceives of research as a utilitarian means for economic development or as an end in itself one of the central problems is to balance two fundamental values: excellence and relevance. Excellence means the strict adherence to a series of research rules that give objective validity to the results and is emphasised by scientists. Relevance is the concern of decision makers and focuses on the ability of research to take on problems that require a solution. The potential to integrate relevance and excellence, and the costs of not doing so, are most clearly manifested in public institutions and in applied fields like public health. For example, efforts to expand health care coverage should always be accompanied by in-depth analysis of the available interventions, comparison of the alternatives for organizing the health system to deliver care, rigorous evaluation of the effects that programmes have on health needs and widespread dissemination of results.

A series of structural obstacles hinder an effective integration of research and decision making. The first obstacle is the definition of priorities. A second obstacle has to do with real differences between political time and scientific time. In general terms, the decision maker is chronophobic while the researcher, in contrast, is chronophilic. A related set of problems is the integration of results from different sources, tolerance to uncertainty of findings, and definition of the final product of research. Decision makers require comprehensive answers, based on the synthesis of evidence from multiple

sources, to a whole problem that is likely to be made up of many different researchable parcels (Frenk, 1992).

Priorities for research always exist. The question is whether they are set in an explicit or an implicit manner. In the field of health, the framework that has been developed since 1990 as a result of the Commission on Health Research for Development (1990) promotes the former. Explicit priority setting tools are being applied that include the Essential National Health Research approach and Combined Approach Matrix developed by the Global Forum for Health Research (Global Forum for Health Research, 2004). This framework accepts and promotes the application of the explicit, transparent, and verifiable processes that guide the conduct of a particular piece of research to guiding the entire research enterprise in the crucial issue of priorities. The application of explicit priority setting mechanisms such as these contains the seeds of a 'science of science' relevant not only to health research but also to research in other fields and sectors including the social and the economic.

The barriers to integrating research and decision-making must be overcome through solutions aimed at the organisation of research. This implies a systemic and systematic effort to have each project solve a problem as well as advance knowledge (Frenk, 1992). A recent example of an integrative solution to research and policy making is the use of evidence in the Mexican health reform of 2003 described in the next section.

The use of evidence in the design and implemenation of Mexican health reform

Achieving fair financing continues to be one of the most daunting challenges facing health systems around the world. Complex and differentiated health systems were developed in the 20th century to accompany the great technological breakthroughs in healthcare, yet effective, fair and sustainable methods to finance health systems are still lacking.

Mexico recently devised a structural reform in health that seeks to respond to the challenge of fair financing. The analytic work to gather the evidence behind the reform was begun in 1999, the reform was passed into law in April 2003, and a universal insurance scheme called the 'System for Social Protection in Health' went into operation on 1 January, 2004 (Secretaría de Salud, 2003a).

The creation of the System for Social Protection in Health seeks to respond, in 2003, to the problem of financial protection and segmentation derived from the original design of the modern health system. It also responds to national and international evidence that signals the absence of financial protection as one of the key problems of the health system in most countries.

The ethical basis of the reform is to democratise the health system by making effective the Constitutional right of all Mexicans to health protection on the principle that healthcare should be provided based on need, to all citizens and residents irrespective of income, place of residence, ethnicity or employment status. For the first time in the history of the modern health system, the opportunity to exercise the social right to health protection and to participate in a formal, public

health insurance scheme will be made available to all Mexicans, independent of their labour market or socio-economic status.

The System for Social Protection in Health seeks to offer all uninsured Mexicans access to subsidised, public health insurance. At the end of a seven year transition period, the new insurance scheme will be available to all Mexicans that are not affiliated to a social security institution. Thus, by 2010 the Mexican health system will have achieved universal financial protection.

The Mexican reform includes a series of innovations in the organisation of financing and the allocation of resources as well as in the design of incentives, including:

- separating funding for personal and non-personal health services and guaranteeing funding for public health;
- providing coverage for an integrated package of services including those that generate catastrophic expenditures;
- creating a separate fund for catastrophic health system expenditures;
- establishing fair and equitable family contributions based on capacity to pay;
- allocating budgets to states based on a formula that accounts for affiliation, health needs and performance;
- roster;
- emphasising the monitoring of progress and evaluation.

With these innovations, the new system seeks to protect families by reducing out-of-pocket spending as a source of health finance, provide greater incentives to providers for efficiency, promote a more equitable distribution of financial and health resources among households and states, offer better quality healthcare for all, and stimulate economic development.

One of the most important aspects of the reform has been the intensive use of evidence in the development, design, advocacy and implementation phases. Evidence will continue to play an important role in all future stages for innovation, monitoring, advocacy, and quality. This constitutes an example of a successful process of combining relevance and excellence that has lead simultaneously to the production, reproduction and utilisation of knowledge for decision making and for the further advancement of research.

A key element behind the use of evidence in the reform was the strong institutional base for research that exists in Mexico. In 1922, Mexico was a pioneer in health research and education when it established one of the first schools of public health in the world. In 1987, the National Public Health Institute (INSP) was created with greater capacity to collect information, undertake analysis, and integrate evidence into the policy-making process. Another important institutional development was the creation of the Mexican Health Foundation (FUNSALUD) in the early 1980s. FUNSALUD is a non-governmental, policy-oriented think-tank founded by leaders in the private sector dedicated to enhancing the evidence-base of policy making (Fundación Mexicana para la Salud, 2003).

Several major initiatives were launched in the 1990s from these institutions. A new line of research on health financing, undertaken by health specialists and economists, was undertaken. The analysis was made possible by the existence of several years of household income and expenditure surveys that had been undertaken by the Mexican Institute of Statistics, Geography and Informatics (INEGI). Further, a basic package of health services was developed by researchers from the INSP and FUNSALUD. This work is published in Frenk, Lozano, Gonzalez Block, et al. (1994).

The research undertaken in the 1990s extended and applied, to the case of Mexico, novel techniques and methodologies that were being developed at the international level. Burden of disease analysis, national health accounts and cost-effectiveness analysis were all applied and drew on global research such as the World Development Report 1993: Investing in Health (World Bank, 1993). This constitutes an example of the application of global research to analysis, evidence-building, and policy-making at the national level.

This research provided key inputs for the 2003 reform. For example, it brought to light that more than half of all health expenditure in Mexico was financed out-of-pocket, much of it coming from the poorest and uninsured families. This information broke with the common preconception that the health system was mostly financed by government. Given the inequities and inefficiencies of out-of-pocket expenditure, the evidence led to substantial research on sources and uses of health finance.

The evidence produced by this research made it possible to identify the five financial imbalances of the Mexican health system:

- rightharpoonup the the low level of overall spending;
- the reliance on out-of-pocket spending as a source of finance;
- inequity in resource allocation between the insured and the uninsured;
- requitable distribution of resources among states;
- nder-investment in infrastructure.

Research generated a better understanding of the nature of, and possible solutions to, these imbalances and this information was used in designing the National Health Programme 2001-6 (NHP) (Secretaría de Salud, 2001).

The NHP was designed to meet the challenges faced by the Mexican health system and the diagnosis pointed to reform, especially on the financing side. In addition to building on national evidence, the NHP applied and extended the WHO framework for evaluating the performance of health systems in the analysis of the Mexican case (WHO, 2000). Equity, quality, and financial protection were highlighted as the three major challenges facing the Mexican health system and specific policies were designed to address them. The policies are associated with five main goals:

- to improve the health conditions of Mexicans;
- reduce health inequalities;
- to improve the responsiveness of public and private services;
- to ensure fair financing for health;
- to strengthen the health system, especially public institutions.

The WHO (2000) framework establishes five intrinsic goals of health systems that in turn generate a conceptual model for measuring the performance of health systems: the level and distribution of health, the level and distribution of the responsiveness of the health system and fairness of finance (Murray and Frenk, 2000 and 2000a; WHO, 2000). This latter goal takes into account vertical and horizontal equity in the distribution of all financial contributions to health made on the part of families including taxes, social security and out of pocket payments. Particular emphasis is placed on the risk of catastrophic health spending that may impoverish families and that are a symptom of over-reliance on out of pocket payments to finance the system (Murray, Knaul, Xu et al., 2000).

In the WHO assessment of health system performance, Mexico had an overall ranking of 51 out of 191 countries, yet ranked 144 on financial fairness (WHO, 2000). The analysis behind the reform and the National Health Programme 2001-06 demonstrated that the poor performance of the Mexican health system on fairness of finance reflected the lack of financial protection faced by families that, prior to the 2003 reform, were excluded from formal, public, health insurance schemes. These families account for more than half of Mexican households and are concentrated in the poorest deciles and include those who do not work, the self-employed, the unemployed, and workers in the informal sector. As a result, insurance coverage in Mexico is regressive both between households and across states (more than 60% of the richest quintile of the population is insured yet the figure is approximately 10% for the poorest quintile of the population). In addition, private spending on health, the vast majority of which is out-of-pocket spending by households, accounts for more than 50% of all health expenditures (Secretaría de Salud, 2004; Knaul, Arreola, Borja, et al., 2003).

Building on the WHO framework, evidence on fairness of financing and catastrophic health spending by households was used to advocate for reorganising the financing of the Mexican health system. It was also heavily used in designing the reform. Much of the analysis, as well as the information that was used for advocacy, focused on the issue of out-ofpocket and particularly catastrophic payments among households. Estimates suggest that every year, between two and four million households suffer from catastrophic and impoverishing payments for healthcare by having to spend 30% or more of their disposable income (total income less spending on food) on health or crossing the poverty line due to health spending (Secretaría de Salud, 2004; Knaul, Arreola, Borja, et al., 2003). Further, 85% of these households are uninsured and catastrophic expenditures are particularly common among the lowest income deciles. These figures provide highly convincing evidence of the financial burden of healthcare for families and the link between health expenditures and poverty.

The information on catastrophic spending, as well as other evidence that is being collected surrounding the reform, is being used for budgeting, generating provider incentives at the state level, monitoring and evaluation. This ongoing effort incorporates a national and international multi-disciplinary

team to collect and generate evidence and analysis. Annual reports have been produced since 2001 and include indicators of performance at the state level (Secretaría de Salud, 2002, 2003, 2004). The indicators use the most advanced methodologies available at the international level coupled with data from in-depth surveys designed specifically for the Mexican health system. Reporting indicators at the state level provides a reference point for the population on how well the system is performing, and will put pressure on institutions to continue to improve. These initiatives emphasise the importance of reproducing knowledge and research for use by all actors, at all levels of the health system.

The analysis of health spending and health financing, and its application to the Mexican reform, is the result of ongoing, in-depth research that began with detailed application of the WHO framework in 2000. This work is being undertaken by an interdisciplinary group of researchers including economists and health specialists from FUNSALUD, the INSP, WHO and foreign universities, in collaboration with policy makers from several different units of the Ministry of Health. This highly productive line of research has generated several new surveys, institutional publications, seminars, student theses and academic papers (Secretaria de Salud, 2001, 2002, 2003, 2004; Frenk, Knaul, Gomez-Dantes, et al., 2004; Knaul, Arreola, Borja et al., 2003; Nigenda, Orozco and Olaiz, 2003; Frenk, Sepulveda, Gomez-Dantes et al., 2003; Torres, 2002).

Further, the findings for Mexico have been used to push forward the global research agenda on health financing through participation in multi-country studies that have been initiated by institutions such as WHO, the World Bank and the OECD (Murray and Frenk, 2001; Murray and Evans, 2003; OECD, 2004; Docteur and Oxley, 2003; De Ferranti, Perry, et al., 2000).

Conclusions

The Mexican experience with the use of evidence for policy making is particularly relevant to other countries as it illustrates the importance of simultaneously building the three pillars of any reform effort: ethical, technical, and political (Reich, 1994). With regards to the first pillar, the Mexican reform was formulated on the basis of ethical deliberation that made explicit the values and principles underlying the proposal. The technical pillar was built on the basis of extensive evidence derived from national studies and also from the adaptation of global, knowledge-based, public goods (Kaul, et al., 2003) such as conceptual frameworks (e.g. the WHO Framework on Health System Performance), standardised methods (e.g. the household income and expenditure surveys), and analytical tools (e.g. national health accounts). In this way, the Mexican case goes beyond the false dilemma between knowledge and action, showing how good analysis serves to correct misconceptions and to place a hitherto neglected problem at the centre of the policy arena. It also demonstrates the falseness of another common dilemma, between global and local realities, as it adapted global public goods to national decision making that may further build the global pool of knowledge about health

system reform. Finally, the political pillar was developed through a strategy that included bringing the ethical and technical elements to bear on the consensus-building process that yielded a solid legislative majority in favour of the 2003 reform.

For evidence to serve as a global public good, it must be used for national policy formulation and national analysis must then feedback into the process of generating international evidence. The Mexican reform contributes to this virtuous cycle. It constitutes an example of the synergy that can exist in the formulation of information and evidence at the national and international levels. International evidence was heavily used for advocacy and design in the initial stages of the reform and will continue to be a key input in the implementation phase.

At the global level, much has been achieved to develop and apply tools for closing research gaps. In 1990, the Commission on Health Research for Development identified and quantified the discrepancy between the allocation of research funding and the distribution of the global disease burden. Following on this finding, and later recommendation by the 1996 Ad Hoc Committee on Health Research, the Global Forum for Health Research was created in 1998 to help close this gap at the global level (Global Forum for Health Research, 2004). Still, regional and national health research forums are only beginning to take shape, as is the application of priority-setting tools in health research at the national level.

Exchanging national evidence from experiences, such as that of the Mexican reform, should be important for stimulating a process of shared learning among countries that face the common challenge of improving health through equity, quality, and financial protection. Global and regional networks to promote shared health research, and the continued expansion of technologies of information, should make this ever more feasible. A stronger process of intercountry exchange of knowledge will generate a more effective use of research at the national and global levels to advance the cause of equitable health and economic development.

Acknowledgements

Several of the concepts proposed here were enriched by discussions with Hector Arreola, Christian Baeza, Stefano Bertozzi, Harvey Fineberg, Emmanuela Gakidou, Eduardo Gonzalez, Miguel Angel González-Block, Miguel Angel Lezana, Rafael Lozano, Jaime Martuscelli, Oscar Méndez, Christopher Murray, Gustavo Nigenda, Gustavo Olaíz, Enrique

Ruelas, Jaime Sepúlveda and Guillermo Soberón. Avedis Donabedian and José Luis Bobadilla provided important inputs into papers from which this document draws ideas. Background work and research assistance for Knaul at the Mexican Health Foundation was supported by the Foundation's Council on Health and Competitiveness, CONACyT (Grant 41314) and WHO. The case study of Mexico benefited from comments received during the International Seminar on Innovations in Health Financing (México City, 20–21 April, 2004; partially funded by the World Health Organization and the World Bank) and from the researchers participating in the World Bank's 'Risk Pooling, Savings and Prevention: Regional Study of Policies and Institutions for the protection of the poorest from the effects of health shocks'.

Julio Frenk is the Minister of Health of Mexico, a post he assumed on 1 December, 2000, when Vicente Fox became the President of Mexico. Prior to his present position, Dr Frenk served since 1998 as Executive Director in charge of Evidence and Information for Policy at the World Health Organization in Geneva, Switzerland. From 1987 to 1992 he was the founding Director General of the National Institute of Public Health of Mexico, and from 1984 to 1987 the founding Director of the Center for Public Health Research. From 1995 to 1998 he was the Executive Vice President of the Mexican Health Foundation, a private non-profit organisation, and the Director of its Centre for Health and Economy. He has also been Adjunct Professor at the Faculty of Medicine of the National University of Mexico.

Felicia Knaul is the General Coordinator for the Modernisation of Education at the Ministry of Education of México. She has also held posts at the Mexican Ministry of Social Development, the Mexican Social Security Institute and the Ministry of Planning of Colombia. She is currently on leave from her position as Lead Economist at the Mexican Health Foundation where she heads the project on Health and Competitiveness. She has also been Director of the Programme in Health Economics and Professor-Researcher in the Economics Department at the Economics Research and Teaching Centre in Mexico City.

Octavio Gómez-Dantés is currently General Director for Performance Evaluation at the Ministry of Health of Mexico. He was formerly Director of Health Policy at the Centre for Health Systems Research of the National Institute of Public Health of Mexico, as well as editor of the journal Salud Pública de México. Previously, he worked as project coordinator at the Center for

References

Commission on Health Research for Development, (1990). *Health Research: Essential Link to Development.*, Oxford University Press, New York.

De Ferranti, D., Perry, G., Indermit S. G., et al., (2000). Securing our future in a global economy. World Bank Latin American and Caribbean Studies. World Bank, Washington, D.C.

Docteur, E., Oxley, H., (2003). 'Health care systems: Lessons from the reform experience'., OECD, WP: 374, Paris.

Frenk, J., (1992). 'Balancing relevance and excellence: organizational responses to link research with decision-making,' Social Science and Medicine, 35(11), 1397-1404.

Frenk, J., Knaul, F., Goméz-Dantés., et al., (2004). Fair Financing and Universal Social Protection: The structural reform of the Mexican health system. Working Paper prepared for the International Conference, Innovations in Health Financing, SSA/Talleres Gráficos de México, México, D. F.

Frenk, J., Lozano, R., Gonzalez-Block, M. A., et al., (1994). *Economía y salud: propuestas para el avance del sistema de salud en México*. Informe final. FUNSALUD, México, D. F.

Frenk, J., Sepúlveda, J., Gómez-Dantés, O., et al., (2003): 'Evidence-based health policy: Three generations of reform in México'. *Lancet*, 362(9396), 1667-1671.

Fundación Mexicana para la Salud, (2003). Visión 2003, FUNSALUD, México, D. F.

Global Forum for Health Research, (2004). The 10/90 Report on Health Research 2003-2004., Global Forum for Health Research, Geneva, Switzerland.

Kaul, I., Conceicao, P., Le-Goulven, K., Mendoza, R. U. (2003) *Providing Global Public Goods: Managing Globalization.*, Oxford University Press, United Kingdom.

Knaul, F., Arreola, H., Borja, C., et al., (2003). El Sistema de Protección Social en México: Efectos potenciales sobre la justicia financiera y los gastos catastróficos de los hogares., En Knaul, F., Nigenda, G., eds. Caleidoscopio de la Salud. FUNSALUD, México, D.F., 275-291.

Murray, C. J. L., Evans, D., (2003). *Health Systems Performance*Assessment: Debates, methods and Empiricism, WHO, Geneva. Ch. 13.

Murray, C. J. L., Frenk, J., (2000). 'World Health Report 2000: A step towards evidence-based health policy'., *Lancet*, 357(9269), 1698-1700.

Murray, C. J. L., Frenk, J., (2000a). 'A WHO Framework for Health System Performance Assessment.', *Bulletin of the WHO*, 78(6).

Murray, C. J. L., Frenk, J., (2001). *Health Systems Performance: Concepts, measurement and determinants*, WHO, Geneva. Ch. 25-26.

Murray, C. J. L., Knaul, F., Xu, K., Mugrove, P., Kawabata, K., (2000). 'Defining and measuring fairness of financial contribution.', *WHO Global Programme on Evidence*, WP: 24.

Nigenda, G., Orozco, E., Olaiz, G., (2003) La Importancia de los medicamentos en la operación del Seguro Popular de Salud., En Knaul, F., Nigenda, G., eds. Caleidoscopio de la Salud., FUNSALUD, México, D. F., 263-275.

OECD, (2004). Towards high-performing health systems. The OECD health projects. OECD, France.

Reich, M. R. (1994) The Political Economy of Health Transitions in the Third World., in Chen, L. C., et al., eds. *Health and Social Change in International Perspective.*, Harvard School of Public Health, Boston.

Secretaría de Salud, (2004). Salud: México 2003: Información para la rendición de cuentas, SSA, México, D. F.

Secretaría de Salud, (2003). Salud: México 2002: Información para la rendición de cuentas, SSA, México, D. F.

Secretaría de Salud, (2003a). Sistema de Protección en Salud: hacia un sistema universal de salud. Firma del Decreto por el que se reforma y adiciona la Ley General de Salud., Diario Oficial de la Federación, México, D. F.

Secretaría de Salud, (2002). Salud: México 2001. Información para la rendición de cuentas., SSA, México, D. F.

Secretaría de Salud, (2001). Programa Nacional de Salud 2001-2006. La democratización de la salud en México. Hacia un sistema universal de salud., SSA, México, D. F.

Secretaría de Salud, (2001a). Hogares con gastos catastróficos por motivos de salud. México 2000., Síntesis Ejecutiva, SSA, México, D. F.

World Bank, (1993). World Development Report, 1993: Investing in Health, World Bank, Washington, D. C.

World Health Organization, (1996). Ad Hoc Committee on Health Research Relating to Future Interventions Options. *Investing in health research and development.*, WHO, Geneva.

World Health Organization, (2000). World Health Report 2000. Health Systems: Improving Performance, WHO, Geneva.

Health research, the MDGs and policy making in Mozambique



Article by The Honourable Francisco Ferreira Songane (pictured), Stijn Broecke and Xavier Modol

f improving health of the poor is a fundamental goal of economic development in itself, it is also a means to achieve other goals related to poverty reduction. The linkages between health and educational achievement, health and productivity, health and economic growth are well documented and generally recognised. The inclusion of health objectives in the Millennium Development Goals (MDGs), endorsed internationally by heads of state and government, bears testimony to this fact.

Less obvious, however, is the role that health research can play in achieving these objectives. Health research generates knowledge that can be utilised to improve the design of health interventions, policies and service delivery. It can significantly improve health outcomes through the improvement of household knowledge and technical interventions such as vaccines, therapeutics, diagnostics and other public health measures

Despite this critical role, health research has suffered from an overall lack of funding and from a huge discrepancy between the allocation of research funding and the diseases or conditions that account for the highest global disease burden. For the past decade, following the ground-breaking work of the Commission on Health Research for Development in 1990, this discrepancy in health research funding has been captured in the expression 'the 10/90 gap' - drawing attention to the fact that of the US\$73 billion annually invested in global health research by the public and private sectors, less than 10% is devoted to research into the health problems that account for 90% of the global burden of disease. A summary check of articles published between January and July 2004 in 5 major international journals, most of them with a public health sensitivity, shows that this disequilibrium continues to apply today (see Figure 1).

Unsurprisingly, the only journal that devoted nearly 90% of its articles to developing countries' issues is *Health Policy and Planning*. All the others, however, show a fundamental bias towards articles on issues that affect high income countries (HIC). On average, 89% of articles of the five journals scrutinised were focused on HIC issues. Moreover, among those papers related to least developed country (LDC) issues, the vast majority were on HIV/AIDS. For the same time period, a wider search on *Medline* using the two keywords 'cancer' and 'malaria' produced 21,778 and 507 hits respectively – a result that is considerably out of line with the burden attached to each

of those diseases (see Table 1) (World Health Organization,

of disease, as measured by disability-adjusted life years, for 1999

Whereas Malaria appears eighth on list of top 20 causes of the global burden of disease, cancer is not represented. Yet research dedicated to the latter far outweighs research on malaria.

The launch of the *Report on Macroeconomics and Health and the Millennium Declaration* should have sounded alarm bells and mobilised the research community and the research funders to rethink about how to conduct the business; unfortunately that does not appear to have been the case.

The present paper aims at analysing the relationship between health research and policy making towards the MDGs, using Mozambique as a case study where appropriate. It begins with a rapid overview of the state of health research in the country, followed by some reflections on the 'ideal' link

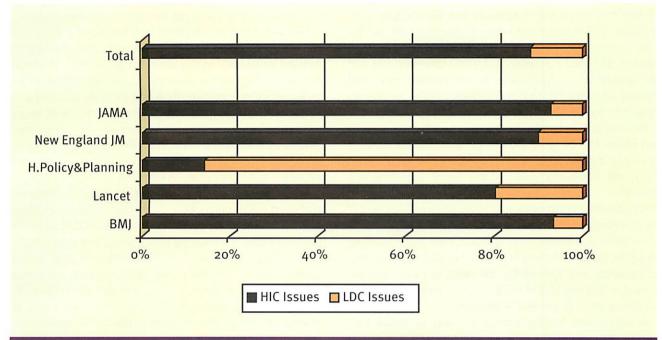


Figure 1: The 10/90 gap in 2004 demonstrated by publication content

between research and policy. Next, the paper offers some specific examples from Mozambique, and some steps forward are suggested in the fourth and final section.

Resources for health research in Mozambique

Resources for health research are particularly scarce in Mozambique. Despite the amount of training on research methodology carried out during the nineties through the Joint Health Systems Research Project for the Southern African Region (Varkevisser et al., 2001), health research in Mozambique is concentrated in a very limited number of institutions. Donor agencies and NGOs also carry out some research, mainly through consultancies, which often represent the only source of policy-oriented research. The structure of demand for and supply of health research in Mozambique, summarised in the Table 2, shows that, while some biomedical and, to a lesser extent, policy-oriented research is produced, the health system is hardly the focus for scholars and consultants.

The miniscule scale of health research in Mozambique is indicated by the level of resources and capacity some research institutions have at their disposal. In 2003, the INS had an external budget of less than US\$200,000; this is normally supplemented by state funds for recurrent expenditure of about US\$450,000, salaries not included. The INS has a core group of about 20 researchers, at least five of them having a PhD. The CISM runs on a budget of around one million Euros per year, which originates from a variety of public and private institutions, mainly foreign. Its core team consists of 28 people,

among whom are 13 MDs, eight MScs and three PhDs.

Information concerning expenditure on consultancy research is not readily available. However, even if this figure were included in our total estimates of health research expenditure in Mozambique, this would still be far from the recommendation of the Commission on Health Research for Development that developing countries should invest at least 2% of national health expenditure on research and research-related activities. For Mozambique, this would represent between US\$5 million and US\$7 million.

In a country like Mozambique, with one of the lowest per capita expenditures for health in the world (US\$8 per capita), it is hardly surprising that sector managers find it difficult to allocate some of these very scarce resources to an activity they often do not regard as valuable in making management decisions.

As a result, the amount of research produced in Mozambique is scant, and that there exists little useful evidence that could shed light on the policy decisions that need to be made in order to attain the Millennium Development Goals in as rapid and efficient a way as possible.

Three of the MDGs directly target health and concern the groups mostly affected by high disease burdens in Mozambique: the MDGs are therefore not achievable without an appropriate level of performance of the health sector.

Some of the solutions for these problems are well known and have proved to be effective, but still are not benefiting those in need. But to accelerate the change, there is also an urgent need

Line of research	Main commissioner	Main executor	
Policy	Donors	Consultancies	
Systems			
Biomedical	Global initiatives, research	Research institutions,	
	institutions, individuals	individuals	

to find new drugs and diagnostics that are cheaper, more accessible and more relevant to the countries most affected. We need to encourage more scientists to be involved in such research and it must be financed at a level commensurate with the dimensions of the challenge. For example more and cheaper artemisinin combination therapies (ACTs) are urgently needed for the treatment of malaria.

With the tools in hand there is a need to deliver the services and ensure that everyone receives them. One of the points of discussion in many meetings and papers is that the countries in need and harbouring most of the health problems lack absorptive capacity and have weak systems. In these circumstances, donors often turn to an NGO and circumvent the government systems and services.

For this reason, health systems research and health financing should be quickly enhanced to answer the questions of efficacy, sustainability and applicability. We need to move from the perception that this kind of research is of a lower level and not valued equally with biomedical research.

Academic and funding institutions need to realise their responsibility towards the achievement of the MDGs, and their work must be tailored to the specificities of countries with limited resources.

The link between health research and policymaking

Ideally, policy-makers should be interested in making decisions based on evidence, which could assist them in formulating judgments, as well as help them with objective and unbiased information to defend the decision taken against those who oppose it. In this context, researchers and policy makers should form a symbiotic relationship in which each one depends on the other: managers commission the research they need and researchers producing the evidence to guide decision making (Pang et al., 2003).

The cases in which research influences policy are, however, the exception rather than the norm. This is due to a number of inter-related reasons. Available research is scarce, and the appropriate piece of research may not be available at the moment the decision has to be made. On the other hand, commissioning it may take too long for it to be of any value. To compound these problems of scarcity and availability, national health research coordination and networking mechanisms are often very weak. There is a lack of formal structures to identify research needs and disseminate the results. Instead, research institutions and individuals decide what to investigate, based on their own skills and/or interests, career possibilities and advancement, a subjective assessment of what will be needed for future policies and strategies, and available funding for any line of study. There is no proper 'research management', whether we are talking about identifying research needs or making the necessary technical and/or financial arrangements for the research to be planned or carried out (Gonzalez-Block and Mills, 2003).

On the other hand, decision makers often lack the tradition or culture of making judgments based on impartial information, so that there is a certain 'lack of demand' for information. Instead, managers in resource-restricted countries make decisions to try to obtain a balance that keeps the systems working.

Decisions are often influenced by international practice and aid agencies' agendas. It is to be noted that the lack of demand for research in this sense lies at the origin of a great number of the problems discussed above: lack of demand for research has an immediate impact on the budgets available to researchers, and without clearly identified research needs defined by policy makers, researchers are left to their own devices to make judgments about what they believe to be important research, or simply what they are personally interested in (Hanney et al., 2003).

Mozambique is no exception on both accounts. Research performed in the country tends to be more responsive to global agendas than to national priorities, more interested in accessing global fora than in influencing local policies, and more focused on individual (researchers/institutions) interests than on the system concerns. Moreover, lines of investigation are almost exclusively in the biomedical fields, with little effort devoted to a more systemic approach; and there is an acute lack of research shedding light on what is needed to apply global solutions to local contexts.

In spite of these shortcomings, in Mozambique some research has been used to make decisions, often of a systemic nature and dimension. Among these, the decision to change malaria treatment lines, expanding the use of impregnated bednets, and modifying the syndromic management of sexually transmitted infections, are the most often cited. In particular, the malaria treatment case was one where the Ministry of Health requested the researchers to answer specific questions related to practical aspects of implementation.

The way forward

The way ahead will necessarily be a complex one, including elements of institutional reform, change in management culture, priority setting, as well as developing funding options.

First, the relationship between policymakers and research institutions should be clarified and subsequently strengthened. The functions of commissioning and carrying out research should be split. The Ministry of Health should decide what issues are to be explored, and then hand the practical aspects to specialised research institutions.

In the case of Mozambique, the existing INS could become an agency gathering expertise on research contracts management, and help in setting the agenda shifting most of its research capabilities to other, external organisations (public and private). Alternatively, the INS could itself become one of those external organisations, retaining its investigation skills and competing for funding.

Linked to the above issue is the reform of how research institutions are financed. Instead of funding a stable body of researchers who, as mentioned above, tend to follow lines of investigation based on their own abilities and interests, research should take the form of contracts. In order to avoid the inherent instability that performance contracts can provoke and which can affect the long-term stability of research institutions, these should be linked to other, bigger organisations, such as universities, thus contributing to the strengthening of their capacities in order to compete under less dependent conditions.

Related to the previous two points is the need for a proper research agenda. There is a great deal of inefficiency in the way research is carried out in resource-poor countries, suggesting that significant progress could be made by simply re-organising the present research community. Besides the research carried out by the main institutions, there are a large number of ad hoc consultancies being commissioned, as well as individualised efforts by various aid agencies. This is a very inefficient way of using scarce resources. If coordination is to be strengthened and resource wastage avoided, all actors involved, from the Ministry of Health leadership to users of health services, researchers and donor partners, should agree on a set of priorities on which lines of investigation should be opened or strengthened. A wide consensus is needed if research has to address the most important issues - these are the principles of a national research agenda and the MDG targets can provide some guidance in the setting of the framework.

The management culture has also to change. Decisions should be made after discussion of the evidence and taking account of political realities. For example, when defining the annual plans and budgets, establishing discussion fora in which priorities and resource allocation are openly debated can introduce discipline into a practice that currently lacks analytical rigour. Helping managers discuss and compete for scarce resources should be the primary goal of research in Mozambique.

With the current level of overall health expenditure and the pressing urgent needs arising from annual epidemics and natural disasters, it is understandable that countries like Mozambique cannot afford to ensure that a defined portion of total resources be dedicated to research. A health research fund could be created with tied external funds to secure the necessary financial stability for relevant long-term research activities. Increasing resources for health research in countries should, of course, go hand in hand with international efforts to correct the 10/90 gap.

References

Gonzalez-Block MA and Mills A (2003). 'Assessing capacity for health policy and systems research in low and middle income countries'. *Health Research Policy and Systems* 2003, 1:1. Downloaded 25/07/04 from http://www.health-policy-systems.com/content/1/1/1

Hanney SR, Gonzalez-Block MA, Buxton MJ and Kogan M (2003). 'The utilization of health research in policy-making: concepts, examples and methods of assessment'. *Health Research Policy and Systems 2003*, 1:2. Downloaded the 25/07/04 from http://www.health-policy-systems.com/content/1/1/2

Pang T, Sadana R, Hanney S, Bhutta ZA, Hyder AA and Simon J (2003). 'Knowledge for better health - a conceptual framework and foundation for health research systems'. *Bulletin of the WHO 2003*, 81(11): 815. In a similar way, it is absolutely crucial that regional linkages and coordination be improved, to take advantage of synergies amongst countries often facing similar problems.

We have in front of us a unique opportunity to do what really needs to be done globally, thus removing the curtain of shame and hypocrisy behind which we hide, constructing arguments to circumvent the problems and irresponsibly ignoring the tragic scenarios that we constantly face.

All the initiatives/institutions involved in MDG-related matters should come together and 'galvanise' action based on the Millennium Project, addressing the gaps that must be closed for countries to meet the goals. The products of the analyses being done by the different Millennium Project task forces will certainly help to show with more clarity where and how to act.

The framework provided by the Global Forum for Health Research seems pertinent for setting the international agenda regarding co-ordination and ensuring a adequate funds for health research. We have to reverse the 10/90 gap, and must do this quickly if we want the younger and future generations to live in a better world and judge us with respect. \square

Francisco Ferreira Songane is the Minister of Health of Mozambique. He is an obstetrician/gynaecologist and previously served as Director of the Beira Central Hospital, a regional referral hospital for the central region of Mozambique, where he was also head of the OB/GYN Department. He also served as district medical superintendent and was involved in teaching and research activities, mostly in the field of maternal health. He is a Board Member of the Global Alliance for Vaccines and Immunization (GAVI) and a member of Task Force 4 on Child Health and Maternal Health within the framework of the Millennium Project.

Stijn Broecke, (economist) and Xavier Modol (medical doctor) both work in the Planning Department of the Ministry of Health, Mozambique. Both are part of the technical team of the department, and involved in co-ordination with different health sector partners.

Rochon, PA, Mashari, A, Cohen, A, Misra, A. Laxer, D, Streiner, DL, Dergal, JM, Clark, JP, Gold J, and Binns MA. (2004): 'Relation between randomized controlled trials published in leading general medical journals and the global burden of disease', *CMAJ* 2004; 170(11): 1673.

Varkevisser CM, Mwaluko GMP and Le Grand A, (2001). 'Research in action: the training approach of the Joint Health Systems Research Project for the Southern African Region'. *Health Policy and Planning*; 16(3): 281.

World Health Organisation (2004). World Health Report 2004. Changing History. Statistical Annexes 2 and 3. World Health Organization, Geneva.

Global health challenges: perspectives from the Fogarty International Center



Article by Sharon Hemond Hrynkow

s the global community strives to address the health objectives contained in the UN Millennium Development Goals we believe a look back as well as forward on the issue of human capacity would prove instructive. We applaud the Global Forum for Health Research for supplying a medium for this retrospective and prospective analysis. We offer our perspective to spark innovative thinking and fresh dialogue as well as to encourage collaborations among partner agencies in order to successfully address shared challenges in global health.

All of us recognise that we need more research to confront the MDG health challenges. Effective vaccines against HIV and AIDS, additional and more effective interventions to protect the health of women and their newborns, and greater understanding of the links between poverty and health of populations, families and individuals - all depend upon strong research foundations, North and South.

Given the importance of the scientist and clinical researcher to the vitality of the research enterprise, we will review current training approaches and outline trends.

Review of training approaches

The Fogarty International Center (FIC) was launched more than 35 years ago to build international linkages for the purpose of advancing medical research. Today, FIC addresses global health challenges by fostering international partnerships on behalf of the US National Institutes of Health (NIH) and Department of Health and Human Services (DHHS). As part of its mission, FIC also supports 12 research training programs in such areas as HIV/AIDS, maternal and child health, emerging infectious diseases, bioethics, brain disorders, trauma and injury, and genetics.

In fact, FIC works with virtually every component of the NIH's 27 Institutes and Centers to link major research funders with critical training programmes. Other technical agencies, including Centers for Disease Control and Prevention (CDC) and US Agency for International Development (USAID), as well as partner agencies abroad, like those in Canada and Mexico, are key partners in specific FIC training programmes. Our partner institutions - primarily universities - on the ground in low- and middle-income nations, play a lead role in defining the scope of the training programmes.

Building on a successful model. The FIC training model links a US institution with a counterpart abroad on a specific research project and supports training to advance that project. Our flexible approach, which allows training PhDs, post-doctoral fellows, Masters students, allied health professionals and others in different areas (such as descriptive epidemiology, virology, behavioural interventions, laboratory methods, and public health) has contributed to strengthened research infrastructures in more than 100 lowand middle-income nations.

For example, the AIDS International Training and Research Program in South Africa, under the leadership of Dr Salim Abdool Karim (chaos.cpmc.columbia.edu/sphdir/ pers.asp?ID=563), has supported 33 Masters and Doctoral students, 59 short-term trainees, and more than 400 scientific publications. Current and former trainees in the Karim programme work on some of the most important research studies in South Africa - those targeting development and deployment of effective HIV and AIDS prevention technologies. Other FIC research and training programmes that use the same model as the AIDS programme are showing similar successes (for details, see the FIC site, www.fic.nih.gov).

We have found that linking vibrant research programmes to ongoing training initiatives is one essential ingredient for longterm, successful research programmes. Further, broad support for the programmes, including the local level, is a key for success.

Future challenges

From our discussion, the question naturally arises: where do we go from here? Among the continuing demands in building capacity are ensuring that young scientists in the South receive solid research training locally and then move into meaningful research positions. Today, infrastructures in many settings are declining or are non-

Among the challenges we collectively face are to develop a strong research culture that allows individual investigators and teams to flourish as well as to translate scientific advances into healthcare practices.

As part of the FIC mission, we are addressing some of these challenges in novel ways. We offer details about them here for information and to prompt discussion.

Combating brain drain. While the return rate for foreign scientists participating in the United States through the FIC AIDS training programs is about 80%, not all programmes fare as well. Two new approaches we recently launched are steps to improve the return rate in other programmes.

The first approach is a re-entry grant for scientists from low-income nations who were supported by the FIC programmes or trained on the NIH campus in Bethesda, Maryland. This so-called 'Global Health Research Initiative Program,' or GRIP, offers support, competitively, for up to five years for junior scientists who return home. With more than 30 GRIPs awarded, FIC expects that the scientists will successfully compete for research funds from the broader pool five years hence. A few other re-entry programmes, such as the Pew and the Human Frontier Science Programme, work toward the same goal.

The second approach supports the development of networks of NIH-trained researchers in their home countries. These pilot 'alumni associations,' now gearing up in Mexico, Brazil, China, South Africa, and India, will network returning scientists to allow such support activities as exchanging information and sharing professional contacts.

Translating scientific advances into care. Two more new programmes provide opportunities for scientists to train in clinical, operational and health services research. The programmes, one focused on mental health and the other on AIDS and TB, will build translational capability in countries in need. What remains a priority is bridging the gap between basic and behavioural science and development and deployment of effective interventions.

Research teams of the future. One of the central tenets of the NIH Roadmap (www.nihroadmap.nih.gov), the initiative launched by NIH Director Elias A, Zerhouni, MD to chart a 'roadmap' for medical research in the 21st century, is supporting novel approaches to building research teams of the future.

Forging relationships among scientists in diverse disciplines and supporting efforts to build successful inter-disciplinary programmes are major challenges facing researchers today. Applying this principle to global health issues, we see the need for new team approaches. For this reason, FIC and the National Center on Minority Health and Health Disparities (part of NIH) teamed with the Ellison Medical Foundation to launch a clinical research training programme.

Started in 2004, this programme supports one year of mentored clinical research training for US and foreign students, paired at the beginning, in a strong research institution in the developing world. Fourteen well-funded NIH sites were selected for the 2004–2005 cycle, each with a strong scientific track record and culture of teaching. We

expect that students in this programme will strongly consider a career in clinical research and that their experiences working on global health challenges will encourage them to take on global issues. We also expect collaborative ties between and among this next generation of researchers.

Medical research and public health. In some countries, training in epidemiology and public health has led to the creation of dedicated public health professional degree programmes. In June 2004, DHHS Secretary Tommy Thompson announced the launch of the first-of-its-kind Masters programme in public health at St Petersburg State University in Russia. This programme builds on research training efforts supported by FIC and its partners, the National Institute of Environmental Health Sciences and the CDC. We expect the programme to lead to the development of a formal school of public health in the coming years. One key to success is building the evidence-based knowledge base, as countries work to develop more effective health care systems. Similar efforts are underway in India and Malawi.

On the horizon. Recognising that inside a university, schools and departments can play different roles in advancing the global health agenda, FIC is exploring new approaches to tackling global health challenges within academia. Under review are models that link multiple schools – for example, business, journalism, medicine, public health, and engineering – in an attempt to more effectively address global health issues. New thinking introduced by academic colleagues from non-traditional disciplines may not only spark new approaches, but more effectively energize the next generation of global health researchers in the developed and the developing world.

In summary, from the FIC perspective, 'global health' means having much to share and much to learn from partners, North and South. We will continue to seek innovative ways to build capacity in research in order to develop and deploy new understanding and technologies with the goal of improving global health. We are open to your ideas and want to exploit new opportunities. As we work toward developing more effective capacity building programmes and identifying new strategies to improve global health, we will always welcome the views of scientists and health professionals from around the world. \square

Sharon Hemond Hrynkow is the Acting Director of the Fogarty International Center (FIC) at NIH. Following a PhD in neuroscience (University of Connecticutt) and postdoctoral training in the area of brain development (University of Oslo), she was a Science Officer at the US Department of State. She joined Fogarty in 1995 and has served in a number of positions, including Deputy Director since 2000. She was elected to the Council of Foreign Relations in 1996.

Closing gaps to achieve the MDGs: roles a medical research council can play - the Indian experience



Article by N K Ganguly (pictured) and Lalit Kant

he Indian Council of Medical Research (ICMR) is an autonomous organisation within the Indian Ministry of Health & Family Welfare. Established in 1911, it has grown into a vibrant apex health research organisation with the mandate to undertake and support basic, epidemiological, applied and operational research in areas of national public health important. It directs its resources towards developing an indigenous research capacity to find practical, long-term, sustainable solutions to the health problems the people of India face.

The Council supports two broad categories of research: upstream i.e. basic and strategic research aimed at generation of knowledge; and downstream, the applied and operational research leading to the development of tools for prevention, diagnosis and management, and translation of research findings into policy and action. It conducts research in its 26 permanent institutes and supports research in universities, medical colleges, research institutions etc. in the form of grants-in-aid.

India is among the 189 member States of the United Nations that have committed themselves in September 2000 to an expanded vision of development - the Millennium Development Goals (MDGs); a vision that has human development at its core to sustain social and economic progress. Eight goals, eighteen targets, and forty-eight indicators have been accepted as a framework for measuring development progress. These were adopted by a consensus of experts from the United Nations Secretariat, IMF, OECD and the World Bank. The goals are to be achieved not later than 2015.

The importance of health to development is now well recognised and this is also reflected in the MDGs by giving prominence to health objectives. It is the result of health research that the people enjoy a longer life expectancy through use of products of research like vaccines, drugs,

The importance of health to development is now well recognised and this is also reflected in the MDGs by giving prominence to health objectives

better management of diseases and life-threatening conditions, etc. Meeting targets related to income, poverty and education will not be possible until there is improvement in health of the communities.

It is believed that, if global progress continues at the same pace as in the 1990s, only the Millennium Development Goals of halving poverty and halving the proportion of people without access to safe water stand a realistic chance of being met, because of progress made by China and India. Regionally, at the current pace sub-Saharan Africa would not reach the Goals for poverty until 2147 and for child mortality until 2165. And for HIV/AIDS and hunger, trends in the region are heading up, not down. It is thus being increasingly realised that for many countries several of the goals seem out of reach. Though impressive strides have been made in biomedicine, their benefits are not reaching the poor people, and the communities who need it most.

There is an urgent need, therefore, to identify approaches and means to translate knowledge into effective interventions. This means better utilisation of the existing tools, development of new tools for diagnosis, treatment, and prevention of diseases as well as working out strategies that would result in their reaching the populations in greatest need.

The areas of ICMR's focus are the communicable diseases, maternal and child health, nutrition, and non-communicable diseases. As the few examples below illustrate, these broad avenues of health research that support the Millennium Development Goals both directly and indirectly.

Halving extreme poverty and hunger

In India as in most developing countries, the bulk of cost of treatment for ill health is met by out-of-pocket expenses, estimated to amount to 84.6% of the total health expenditure. This has serious consequences for the poor. A World Bank analysis has shown that direct out-of-pocket medical costs may push 2.2% of Indians to poverty in one vear (UNDP, 2003).

ICMR believes that reduction of poverty through income generating schemes catalyses community participation in disease control programmes. Except during an epidemic, poor villagers cannot be expected to devote time to participation in a disease control programme at the cost of other tasks related to their livelihood. Innovative strategies are being applied to engage these populations in income generating profitable activities in which health interventions are a by-product.

In a project on integrated bio-environmental control of malaria, schemes such as social forestry in areas with a high water table, production of edible fish along side larvivorous ones, and conversion of lagoons with mosquitogenic conditions into prawn culture ponds have been used. In some areas algae grow profusely in ponds and protect the mosquito larvae and the eggs from being devoured by larvivorous fishes. Algae removed from such ponds has been used to prepare paper and cardboard. These schemes appealed to the community as they helped in generating income (by selling of wood, fish, prawns, paper, etc.) and mosquito control is a spin-off (World Bank, 2001; National Family Health Survey, 2000; Gupta et al, 1989).

ICMR is facilitating schemes aimed at eradicating extreme poverty indirectly by decreasing loss of wages involved in the days lost due to illness, through developing more effective treatments (e.g. introduction of α,β -arteether, and drug combination treatment of malaria using drugs like artesunate and sulfadoxipyrimethamine) and regimens of shorter duration (especially for chronic diseases like tuberculosis using fluoroquinolones, adding ofloxacin and minocycline to WHO's multi-drug therapy for leprosy and kala-azar).

One of the targets of the Goal is to also to reduce the percentage of underweight children by one-half between 1990 and 2015. For India, this would mean a reduction in child underweight rate from 54.8% in 1990 to 27.4% in 2015. The major causes of child malnutrition in India include:

- Infant feeding practices: National Family Health Survey-2 (NFHS-2) data indicate that nearly half of Indian babies have to wait to be breastfed for more than a day after they have been born. Another common feeding practice is the early termination of exclusive breastfeeding and introduction of supplementary feeding (Rajagopalan and Panicker, 1985).
- ♣ Infections: Illnesses and infections, especially diarrhoeal diseases, are strongly associated with child malnutrition. NFHS-2 data suggests infants suffer from diarrhoea by the age of six months, having experienced an average of 2.2 diarrhoeal episodes and by age of 12 months 5.2 illness episodes. NFHS-II data also show that children who have suffered a diarrhoeal episode are 15% more likely to be underweight compared to children who have not experienced diarrhoea (Rajagopalan and Panicker, 1985).
- Maternal weight and low birth weight: Malnutrition begins early in life when children are born with low birth weight. Nationally, 20–25% of births are at low birth weights. Low birth weight of offspring is not only an evidence of poor maternal nutritional status but also an indication, of course, of future developments.
- ICMR is supporting studies on counseling for exclusive breast feeding, safe weaning practices for prevention of diarrhoea, community-based interventions for prevention of neonatal sepsis, and national nutrition monitoring.

In order to help women in fertility regulation, research is being directed towards increasing contraceptive choices for women (implants like Norplant-6, Norplant-2 and implanoa; injectables like two monthly NET-enanthate, monthly Cyclofem, vaginal sponge, triphasic pills)

Promoting gender equality and empowering women

Gender equality is central to many research studies being undertaken under the aegis of the ICMR. In India there has been a more than 200% increase in employment of women in industry. The Council is supporting studies focusing on environmental health problems of women and determinants of outcome.

Fertility regulation is an important element of reproductive health. In order to help women in fertility regulation, research is being directed towards increasing contraceptive choices for women (implants like Norplant-6, Norplant-2 and implanoa; injectables like two monthly NET-enanthate, monthly Cyclofem, vaginal sponge, triphasic pills) and promoting emergency contraception (levonorgestril, Cu-T200B). Development and evaluation of women-controlled interventions like the microbicides (Praneam Polyherbal tablet for management of abnormal vaginal discharge, development of microbicides using peptides like maganin, nicin and cellular sulphate), and research on female condoms is also being undertaken.

Reducing by two-thirds deaths among the under fives

It is considered that reduction in infant and child mortality is in many ways the most important MDG, as children are the most important assets of a nation. In India, approximately I.72million children die each year before reaching their first birthday. The MDG target is to reduce infant and child mortality by two-thirds between 1990 and 2015. For India, this would imply a reduction of Infant Mortality Ratio (IMR) to 27 and of the under five mortality rate (U5MR) to 32 by 2015.

Results of previous surveys and multi-variate analysis of NFHS-2 data, as well as a simulation model, indicate that a package consisting of expanded child and maternal immunisation, antenatal coverage, nutritional supplements and home-based neonatal services is likely to be a high impact intervention strategy.

The ICMR is supporting a study for the use of bug-busters (probiotics) for prevention of sepsis in neonates. While probiotics have been described for many decades, their scientific basis for use in human medicine has arisen only recently. The strain Lactobacillus planatarum has been found to block E. coli adherence to caco 2 cells and passage of E. coli in a transwell cluster system. Several studies have reported immunomodulatory, specific anti-infective and anti inflammatory action of normal gut flora and probiotics. A Indo-United States collaborative study is ongoing in the state of Orissa with the objective to develop an appropriate infrastructure to monitor occurrence of neonatal sepsis in

community and hospital born infants. The study also emphasises developing and implementing interventions to reduce risk of neonatal sepsis by use of probiotics and alcohol-based products for hand washing in hospitals and community based health care set-ups to reduce pathogen transmission (Sharma, 1993).

Another study that merits attention is aimed at promoting home-based new born and infant care. Although the infant mortality rate in the country has declined over the years, it is observed that most of this reduction is due to a decline in the post neonatal component. Neonatal mortality constitutes about two thirds of infant mortality. In India, most deliveries take place at home and the community has limited means of reaching health facilities during emergencies. In addition, their inability to recognise danger signs in the newborn results in delayed care-seeking and hence most neonatal deaths occur at home. This scenario is unlikely to change in the near future. Thus, it has become essential to find ways to provide

Neonatal mortality constitutes about two-thirds of infant mortality. In India, most deliveries take place at home and the community has limited means of reaching health facilities during emergencies

neonatal care to normal, 'at risk' and sick neonates in the home setting to reduce neonatal mortality. A recent study on home-based newborn care, including treatment of sepsis by village level workers, has shown more than 50% reduction in neonatal mortality in a district in Maharashtra. The feasibility of extending this experiment through existing health systems in rural sites of five states is being tested. If found successful, this will be a model for reduction of neonatal mortality in the country, given the fact that in India only 25% of all births take place in institutions like hospitals and primary health centres and the rest take place at home; moreover, skilled attendants at the time of delivery are available only for 43% of births. In addition, nutrition monitoring for identification of malnutrition is being continued on an going basis.

As indicated above, a large number of children die because of severe infections. Effective vaccines are available against some of these, but it has not been possible to introduce them in the national immunisation programme because of lack of evidence on the magnitude of the problem in India, and the cost. One such infection is that of H influenzae b (Hib). A vaccine-probe study is being planned to begin shortly using Hib conjugate vaccine/DTP/Hep combination vaccines (study vaccine) and DTP/Hep B (control vaccine). Alternative methods of delivery of existing vaccines is also being explored. It is planned that measles vaccine, which is presently administered subcutaneously, will be tried as an aerosol. Phase I clinical trials are scheduled for later this year. Administration of measles as an aerosol would help achieve higher coverage, and should be devoid of problems associated with unsafe injection practices. The trials will also enable assessment of a technology which could be used for mass administration of vaccine should a measles eradication programme arise in future.

Reducing by three-quarters the number of women dying in child birth

India has a high maternal mortality ratio (4-5 per 1000 live births). It is estimated that 25,000 women die annually due to hemorrhages. Post partum haemorrhage (PPH) and underlying anemia are the primary causes of maternal mortality in India and account for approximately 25-30% of maternal deaths. A multi-site study is being carried out to examine the feasibility of the prophylactic use of Misoprostol in the prevention of PPH, to be applied at the peripheral level by paramedical workers at the time of conducting delivery. This project would serve as a model applicable to rural settings throughout the country and possibly have implications as well for improving delivery practices in other developing countries. The study is being carried out in a sample of Primary Health Centres in five states in the country. Active management of the third stage of labour, a known evidence-based intervention that includes administration of a uterotonic, can prevent PPH due to uterine atony. Misoprostol (oral prostaglandin) has a tremendous advantage over other currently available uterotonics, as it is inexpensive, stable at room temperature and is given orally. It has minor side effects that are self-limiting and usually do no require any medication.

Anaemia is the commonest medical cause of maternal death. Encouraged by the success of universal iodisation of salt in the control of micronutrient deficiency due to iodine, studies are being undertaken on double fortification of common salt with iodine and iron as a means of combating nutritional anemia.

Approximately 20,000 women die each year due to unsafe abortions, usually as a result of termination of pregnancy by unqualified and untrained providers performed under unsafe conditions. Evaluation of simple kits for early detection of pregnancy and studies on medical methods of pregnancy termination for unwanted pregnancies, such as RU486 with prostaglandins, are being carried out.

Halting and beginning to reverse spread of HIV/AIDS, and incidence of malaria and other major diseases

Each year there are about 5.1 million reported cases of HIV; 1.6 million cases and 500 deaths due to malaria and 14 million cases with 1.8 million new cases and 0.4 million deaths due to tuberculosis.

Research on HIV/AIDS, tuberculosis, and malaria are high on the priority list of the ICMR. It has initiated several studies directed at combating HIV/AIDS (e.g. development and evaluation of an effective and affordable vaccine; cost-effective anti-retroviral therapy; large scale prevention trials using female condoms; newer regimens for prevention of mother to child transmission; pediatrics AIDS; behavioural interventions to prevent HIV), malaria (eco-friendly integrated methods for control of malaria; development and evaluation of new drugs including combination therapy, development and evaluation of new insecticides and bio-control methods; preparation of

sites for malaria vaccine(s) evaluation, development and identification of tools for stratification of malariogenic areas for developing situation-specific control strategies to improve the efficacy of implementation of control programmes); tuberculosis (e.g. development of newgeneration vaccines; development and evaluation of new drugs and drug regimens which are more effective and are of shorter duration for pulmonary and extra-pulmonary tuberculosis, chemotherapy trials and epidemiological studies in HIV-TB; development of rapid and reliable diagnostics) and other infectious diseases through development of preventive and therapeutic approaches.

Ensuring environmental sustainability

ICMR's initiatives include conducting studies related to environmental stability (like occupational exposures, indoor air-pollution; arsenic levels in water; pesticides in environment and foods; develop biomarkers of exposures to environmental toxicants, etc); study extent of occupational exposures, indoor air pollution to develop interventions; monitoring pesticides in environment and foods; environmental genetics (develop biomarkers of exposure to environmental toxicants); and development of hazard communications procedures

Forging partnerships for development

Some examples of ICMR's initiatives in establishing partnerships for improving the availability and access and decreasing the cost of drugs needed for diseases of poverty include: TDR-Asta Medical, Germany: for Miltefosine; Panacea Biotec-for Praneem (a microbicide); WHO-SmithKline Beecham for albendazole in filariasis elimination strategy; aerosol measles vaccine - Serum Institute of India: Typhoid vaccine - International Vaccine Institute, Seoul, Korea; Hepatitis A vaccine - BBIL; Interferon - Shantha Biotech; rota virus vaccine - Bharat Biotech. The Council is

India today is better placed in term of knowledge to tackle the challenges of poverty, malnutrition, maternal and child health, infectious diseases, gender equality, unclean environment

also one of the founding partners in setting up a new initiative for development and evaluation of drugs for neglected diseases (DNDi).

India today is better placed in terms of knowledge to tackle the challenges of poverty, malnutrition, maternal and child health, infectious diseases, gender equality, unclean environments etc. The issue is how best to apply the knowledge to benefit the poorest people. ICMR is contributing towards reduction of the gap in achieving the MDGs through health research. Many of the research findings have found a place in national programmes, while efficacy of others is being demonstrated. This account illustrates how a medical research council can contribute to achieving the MDGs (World Bank, 2004).

N K Ganguly is the Director-General of the Indian Council of Medical Research, New Delhi India. He is the past President of the National Academy of Medical Sciences, India and General Presedent (elect) of the Indian Science Congress Association (2004-05). Prof Ganguly is a member of the Foundation Council of the Global Forum for Health Research, Geneva.

Lalit Kant is Senior Deputy Director-General at the Indian Council of Medical Research, New Delhi. He heads the Division of Epidemiology and Communicable Diseases, and also leads the group on Policy and Planning.

References

Gupta, DK, Sharma, RC, Sharma, VP, 1989. 'Bioenvironmental Control of malaria linked with edible fish production in Gujarat.' Ind J. Malariol 1989, 26: 55-59.

National Family Health Survey, 2000. National Family Health Survey (NFHS-2): 1998-99. International Institute for Population Sciences, Mumbai, India and ORC Macro, USA.

Rajagopalan, PK, Panicker, KN, 1985. Financial rewards ensure community involvement. World Health Forum 6:174-176.

Sharma VP, 1993. Malaria control: bioenvironmental methods and

community participation in Community Participation in Malaria Control, V P Sharma (ed). Malaria Research Centre, Delhi, India 1-42.

UNDP, 2003. Human Development Report 2003. Oxford University Press.

World Bank, 2001. India: Raising the sights - Better health Systems for India's Poor. World Bank, Washington DC.

World Bank, 2004. Attaining the Millennium Development Goals in India: Role of Public Policy & Service delivery. The World Bank, Washington DC.

Creating a culture of health research implementation: ZonMw in the Netherlands



f there is one lesson to learn from implementation research in the last decade it is that research does not 'speak for itself'. There is a growing awareness of the gap between the knowledge we have and the care we deliver (know-do gap). If research is to spawn innovations in health systems it needs help in getting from the laboratory to the local leaders or from the bench to the bedside. The preoccupation of the 1990s with better dissemination - guidelines, critical appraisal and the other early tools of evidence-based medicine - is increasingly being eclipsed by attention to onthe-ground implementation. Recruiting local clinical leaders as change-agents, embedding research findings in organisational systems with real-time performance feedback, attaching rewards and sanctions to evidence-based performance indicators, and even involving potential users with research projects from the outset have all come to replace the more passive dissemination approach that dominated the earlier era.

In the United States, the Agency for Healthcare Research and Quality now funds 'Partners in Health', a programme designed to smooth the implementation of research findings into practice, and it recently re-designed its user liaison programme to incorporate best practices in research implementation

National health research funding agencies have not been oblivious to this trend. For instance, Canada's Health Services Research Foundation is dedicated entirely to the role of brokering implementation of relevant research into the system. In the United States, the Agency for Healthcare Research and Quality now funds 'Partners in Health', a programme designed to smooth the implementation of research findings into practice, and it recently re-designed its user liaison programme to incorporate best practices in research implementation. In England the NHS R&D programme created the Service Delivery and Organisation initiative with a mandate to better disseminate findings and ensure they get used by the system.

The Netherlands' national health research funding organisation - ZonMw - has been no exception to this trend.

Over the last six years they have created a culture of implementation in the country through amalgamation of agencies, national workshops, and specific initiatives that require and support implementation as part of the research funding process.

The creation and organisation of ZonMw

In 1998, the Dutch Minister of Health created (by law) an organisation for funding health research and development -ZON- with a mandate for knowledge transfer and implementation of results. In 2001, it was brought together with the more traditional health research council (MW) of the Netherlands Organisation for Scientific Research (NWO) The resulting agency - ZonMw - was created with an independent Board, a mandate to focus as much on implementing research findings as on creating them, and a budget of ¤85 million a year.

ZonMw is organised into a series of programme areas. Some, like genomics or tissue engineering, represent traditional investigator-initiated areas of interest. Other programmes are commissioned by the Ministry of Health and represent areas that connect directly to the pressing interests and needs of the health system e.g. health promotion, nursing and patient safety.

Each programme area is assigned not only the traditional project officers who manage and monitor funded investigators, but also communications and implementation officers to work on knowledge transfer and potentially implementing findings. These implementation staff meet regularly as a team. Over the life of the agency they have created a culture in which increased attention is now given to research implementation by both researchers and health system practitioners.

ZonMw developed an explicit framework to underpin these dissemination and implementation activities. It is based on the assumption, supported by disparate knowledge utilisation literatures, that evidence-based innovation will only flourish when there is active and ongoing exchange of ideas, research and experience between knowledge creators and users. This approach emerges from the work of social scientists such as Havelock or Rogers working on the spread of innovation, as well as the more recent work on research implementation To overcome this resistance ZonMw undertook a series of public relations and marketing activities, ran a number of workshops and held two national conferences on implementation. Indeed, with an audience of more than 800 at each national conference, their popularity is one measure of the success of these marketing activities

specifically in the health area: Grol emphasing the role of planning, Lomas underlining the importance of ongoing linkage and exchange, Davies stressing the value of tacit knowledge, Walshe on the influence of the societal and political environment and Plsek focusing on the context of a complex adaptive health system.

Creating the implementation culture

ZonMw had to overcome a lot of resistance in realising this approach. Initially researchers claimed that implementation was not their role and it took them beyond their core business of doing research. Practitioners claimed that it was too difficult to work with researchers, who were poorly connected to the world of practice and whose simplified research questions did not reflect the complex practical world of health service delivery. Both claimed that research implementation only enlarged bureaucracy and levelled new expectations in an already pressure-filled work environment.

To overcome this resistance ZonMw undertook a series of public relations and marketing activities, ran a number of workshops and held two national conferences on implementation. Indeed, with an audience of more than 800 at each national conference, their popularity is one measure of the success of these marketing activities.

Furthermore, ZonMw made numerous changes to internal processes and activities to reflect the commitment to implementation. Knowledge transfer and implementation was made a condition for and an integral part of project funding; specific resources were earmarked for dissemination and implementation activities; workshops were organised on how to write applications which incorporated implementation plans; application forms and review procedures were redesigned to highlight the importance of implementation; guidelines and checklists were created for applicants, reviewers and project leaders; funds were provided for others

Furthermore, ZonMw made numerous changes to internal processes and activities to reflect the commitment to implementation

to create training courses on implementation; and knowledge brokering was recognised as one of the agency's core activities.

It is this comprehensive approach by ZonMw – from exhortation, through facilitation, on to regulation, and finally to reinforcement and celebration – that is most likely to succeed. Rather than isolating implementation as an add-on task, to be undertaken after the serious business of research

is complete, it is embedded in all aspects of ZonMw's and the investigators' work. Even the basic scientists are encouraged to think about implementation, although in their case it is to answer the question 'to which disciplines and applied researchers should I be transferring the results from my study?'

The impact of these efforts on the overall culture of implementation can be seen in the results of a recent survey of 77 projects completed in 2002. Most of these projects had a mix of research and development objectives and activities. Almost 80% reported actual or planned transfer of their results to a relevant person or organisation (30% with actual activities that were already underway and 50% with commitments to realise an existing plan).

Targeting projects for implementation

As part of this broad cultural change there are also specific efforts in ZonMw that, over the life of a project from application to completion, accumulate enough knowledge on each to identify particularly promising targets for additional implementation efforts.

At the application stage each project proposal is systematically assessed for knowledge transfer and implementation potential. This is done on the basis of applicants' dissemination and implementation plans, which include information on the societal relevance, potential adopters and context for implementation of the future

ZonMw organises regular meetings of project leaders in which knowledge transfer and implementation are on the agenda. Annual progress and final reports for each project are expected to focus as much on implementation as on the research and development itself

findings. Both scientific quality and implementation potential determine final funding decisions.

After one or two years of funding, project leaders must develop a far more detailed dissemination and implementation plan. ZonMw staff give advice, support and training if necessary, and bring project leaders together with relevant stakeholders (health researchers, providers, policymakers, managers, patients/consumers). ZonMw organises regular meetings of project leaders in which knowledge transfer and implementation are on the agenda. Annual progress and final reports for each project are expected to focus as much on implementation as on the research and development itself.

All this work with both the responsible project officer in ZonMw and the funded project leaders, allows the implementation staff to assess the most promising of these projects for increased implementation attention. An initial screening of the projects is undertaken in the final year of funding. The most promising of the projects that make it through this screen are then subjected to a more extensive Implementation Risk Analysis, in which detailed assessment is done of the core elements for implementation (see Box 1). Finally, results of these assessments are presented at routine

meetings of the ZonMw implementation team, where only the most promising of all - termed 'pearls' - qualify for special attention and resources in a full implementation plan (approximately 5-10 per year).

Even though the initially funded projects from the early years of ZonMw have only become available starting in 2002, there are already examples of projects that have gone through this process and led to significant changes in local practice and spread to a regional level.

Conclusion

The experience at ZonMw indicates that a concerted effort to change attitudes and approaches to implementation in the researcher and practitioner communities at large, complemented by a targeted and aggressive strategy to implement particularly promising project results, can effectively create a culture of implementation over a relatively

short period of time. Due in no small part to the efforts of ZonMw, evidence-based decision-making is increasingly becoming the norm not the exception in the health system of the Netherlands.

J Ravensbergen (ZonMw)

J Lomas (Canadian Health Services Research Foundation)

ZONMW

The Netherlands

Fax: +31 (0) 70 943 5100

A new order in health and health research



Article by Francisco Becerra-Posada (pictured) and Adolfo Martinez-Palomo

he foundations for the present health research system were instituted in Mexico in 1939, when the former Ministry of Health and Assistance established the Institute of Tropical Diseases, and a few years later, the Mexican Institute of Social Security and the Children's Hospital of Mexico (Los Institutos Nacionales de Salud, 2003.).

The group of physicians to whom we owe the foundation of the National Institutes of Health (INSalud) may be referred to as visionaries, since they did not allow Mexico to stay behind in medical progress with respect to other countries. On the contrary, they dedicated their work and endeavour to the fulfillment of a dream: the creation of medical institutions qualified to offer the best healthcare to the defenceless population, while preparing at the same time highly trained human resources for Mexico and other Latin American countries, and excelling in the progress of scientific research.

The INSalud represent the primary asset of health research, medical training and modern medicine in Mexico, and thus they are being strengthened to maintain excellence in medical practice, to generate new knowledge, and to train human resources, so that the country remains in the lead and its population receives the benefits of progress in medical care.

INSalud is eleven institutions grouped in a sub-sector of the Ministry of Health; they operate for the entire Mexico. As tertiary care institutions, INSalud is involved in health restoration and rehabilitation of patients with diagnostically and therapeutically complex disorders, sustained by first-rate medical staff and modern technology.

Mexican medicine holds an outstanding reputation in Latin America. The results obtained by INSalud certainly represent one of the pillars that support this tradition. Many Latin American cardiologists, oncologists, nutritionists, and internal medicine specialists, among other specialties, have been trained in the INSalud.

At present, over 1,400 residents in various specialties are being trained. Scientific research has significantly contributed in various fields; in recent times the most productive areas have been neuroscience, immunology, infectious diseases, gastroenterology and public health.

Health research policy and funding

A modern health system, facing global challenges and local disparities has to make use and take advantage of its assets. In Mexico, the findings of health research performed at

INSalud have been relevant to current health policies and decision-making.

Since research products help to define policy in the health sector, it is important to have a structural idea of where to go. In terms of health research, a 'blueprint' was worked out with the contribution of the health research community in Mexico. The result was the Action Program in Health Research, which aims to move health research in Mexico into a virtuous cycle in which there are more funds, and the research performed increasingly addresses the health problems faced by the country (Programa de Acciún Investigaciún en Salud, 2002).

The research objectives of this programme are now linked to the Health and Social Security Research Fund, the first of its kind in Mexico, in which the main public health institutions in the country contribute to this fund, which then is matched by the National Science and Technology Council. In its third year of operation, this fund has financed 158 research projects carried out by over 80 different institutions and universities that perform health research in Mexico.

The Fund has completed two calls for proposals, and is currently in the third cycle. Nearly 1,000 proposals were received in the first two rounds, of which 73 were funded in the first round and 87 in the second one.

Mexican health research production has experienced a constant increase in terms of quantity and quality. Each year there are more publications in high impact journals in health research. 55% of the total publications in 2003 were published in journals indexed in Current Contents, while 45% were included in Index Medicus.

The effort to build a comprehensive network of health research in not limited to our borders. International links have been established through both official and personal channels, contributing to constant academic exchange. Most of the Mexican health research institutions and universities have been or currently are participating in research projects linked to the National Institutes of Health of the United States, the INSERM in France and the Canadian Institutes for Health Research, for example.

This collaborative effort is, from our perspective, one of the many ways to face current global challenges in health. As such problems are global, Mexico is not exempt from them, and in part, responsible for the disparities we face in the country. These disparities are being addressed in order to contribute to the compromises established in achieving the

Millennium Development Goals (MDGs), and many action programmes in the Ministry of Health are aimed to work in a comprehensive way to solve them.

Health as an investment for development

The Human Development Report 2003 published by the United Nations Development Program (UNDP, 2003), states that the main components of human development are living a healthy life, being educated, having a decent standard of living and enjoying political and civil freedoms. A healthy person, a health family, a healthy community will all contribute to a healthy country in which healthy populations can participate and make a better contribution to development of all aspects of it. The global challenge then, is to have health at the centre of all countries' development efforts.

As mentioned in the report of the Commission on Macroeconomics and Health (2001), ill health will severely impact on the individual's income, thus affecting families and communities, due to the costs they have to incur in order to seek medical care, the loss of work hours and the loss of lives due to premature deaths. There are many examples of how health-related issues have an impact on the economy of a country. Let us take the level of investment in Africa, which is one of the lowest in the world. Who is interested in investing in countries that have communities with up to 30% HIV infection? Mexico lived through such an experience 11 years ago when we experienced a cholera epidemic and tourism was seriously affected (Frenk, 2002).

An analysis performed by the Center of Social and Economic Analysis of the Mexican Health Foundation, with data from the National Survey on Household Income and Expenditure 2002 in Mexico, revealed that 3.9 million women over 12 years of age spend an average of 15.7 hours per week taking care of sick household members.

The level of investment in health that a country has, and the health status of its population, have a direct influence on the development of human capital, productivity levels and the combating of poverty, all vital in social and economic development. As this investment in health allows access to equitable, efficient and quality health care delivery services, a virtuous cycle starts flowing, and consequently, individual and societal competitiveness as a whole may be achieved. This will, as a result, facilitate the transition to better human and economic development.

The opposite result would be in countries experiencing a vicious cycle with inequitable, inefficient and bad quality health services, which will then constrain community capabilities to achieve better human and economic development. Poverty will then remain in all processes and will decrease development and produce greater inequity of opportunities due to limited human resource development. The inefficiency of the health sector will be reflected in a higher out of pocket expenditure for treatment, thus affecting the possibility of savings in the households, a lower productivity, and an increase in health costs.

In short, the cost of bad health for the economy as a whole are enormous, and have two major components. One is the total of individual losses in all the different dimensions it may have, and the other is the resulting losses from all the externalities (Global Forum for Health Research, 2004).

The challenges

Returning to the challenge, previously mentioned, regarding the positioning of health at the centre of human development, all countries have to create the conditions to facilitate access to health goods and medical care services for all the population. Countries have to develop systems that can easily respond with quality and efficiency to the needs and expectations of their populations in order to widen their choices. Countries must confront a vast array of challenges in order to make their health systems meet population needs. The populations of developing countries continue to suffer from life-threatening infections, reproductive health problems, and malnutrition, which keep infant and maternal mortality at unacceptably high levels. On the other hand, they are also facing the emerging challenges of non-communicable diseases and injuries.

Low- and -middle income countries (LMIC) contribute about 3% of the total funds from public sources devoted to health research in the world, while high income countries contribute 47% (Global Forum for Health Research, 2004). This shows that funding of healthcare, rather than health research, is a priority in LMIC. However, even though most or all of the funds allocated to health might go into healthcare delivery and prevention, disparities in health access and quality of services are widely known. Countries continue to live in the vicious cycle.

In developing countries, health systems must be designed to implement more efficient ways of dealing with the backlog of infections, reproductive health problems and malnutrition while also developing affordable and effective interventions for non-communicable diseases (WHO Ad Hoc Committee, 1996). Most countries lack adequate training for health staff and acceptable certification procedures for facilities. Sizable sums of public money are spent on tertiary level hospitals at the expense of cost effective interventions delivered at the primary level. Finally, access to basic health services and essential drugs remains a pervasive problem in rural and dispersed communities (World Health Organization, 1995).

There is a need for deeper understanding by each country of the determinants of health. Enormous differences can be seen in the World Health Report (2004). In this report, we see that per capita health expenditures by governments not directly correlated to the infant mortality rate (IMR). There are some indications that the less spent, the higher is the IMR. However, the lowest IMR is in Sweden, Japan, Singapore and Iceland (IMR of 3), while the expenditure in those countries is (US\$/2001) 1,935, 1,660, 333, and 2,192, respectively. We can also see that while Kenya has a per capita government expenditure on health of US\$24 in 2001, it has an IMR of 72, while Afghanistan has an expenditure of US\$ 18 and has the largest IMR reported of 189. Sierra Leone has an IMR of 181 while they have an expenditure of US\$16. We need to understand better these determinants of health in order to have comprehensive health policies aimed at correcting these gaps.

National governments can no longer deal on their own with the determinants of health that arise from interactions at the global level. The technologies to satisfy health needs are being produced and traded through global processes that often transcend the regulatory capacity of individual governments. The right to quality healthcare is incorporated into the global movement for human rights, and governments are facing demands for better services (Frenk, Sepúlveda et al., 1997).

International health organisations seem to be the ideal vehicle for contending with health problems that go beyond the capacity of national health systems. Current international health agencies, however, were designed for a different scenario, where few problems needed global action. One single organisation could manage world health affairs, especially given the clear priorities that characterised that time. The development of international health agencies has not kept pace with the evolution of new health challenges, and some agencies have adopted functions that exceed their original mandates (Frenk, Sepúlveda et al., 1997).

Reformation and international health policy

There have been efforts to help low income countries to develop suitable health policies in order for them to find the means and resources to ensure better levels of health. After the Alma Ata conference, an initiative was launched by the Pew Charitable Trust, the Carnegie Corporation of New York, the World Bank and the World Health Organization to run an International Program for Health Policy. It was formed through a network of over 200 analysts and decision makers from Africa, Asia and Latin America and focused their efforts in the following topics:

- resource allocation and use in healthcare programmes;
- financing of health programmes;
- governmental and non governmental contribution to health services:
- health policy implication in other sectors;
- consequences of individual behaviour in health;
- implementation of health policy (Lúpez-Antuõano, 1993).

Global health has reached a time of definitions - definitions from the perspective of the MDGs regarding international health policies, collaboration, common research agendas, and health systems planning and structuring, to mention a few. A new order is needed. Rational and clear actions should be taken in order to reverse the current situation in global health. New and visionary initiatives have to be

launched with the support and sponsorship of international agencies and governments of high-income countries.

Many organisations and networks have undertaken efforts to disseminate research results and knowledge. However, a much wider dissemination is needed to make these available and ensure that they are translated to policy makers.

The future

We need a new vision for health research in order to answer the questions that countries and regions are facing. We need a collaborative effort to have an international health research Agenda in which countries participate with either funding, expertise or researchers. We need a new vision to respond to the challenges healthcare brings on a daily basis to all governments; we need to find ways to have access to better and cheaper drugs; ways to use advanced science for solving old problems and making treatments less expensive; more prevention, rather then diagnosis and treatment, is needed. Someone has to take the lead. Who is willing to take the challenge?

Francisco Becerra-Posada is Director for Academic Agreements and Diffusion at the General Directorate for Health Research Policies of the Ministry of Health in Mexico. He has held various managerial and administrative positions within the Ministry of Health at the local, state and national levels. He has been a National Consultant for the Pan-American Health Organisation in Mexico, and a Consultant for USAID, PAHO, WHO, and other organisations in Africa and Central America.

Adolfo Martinez Palomo is Director General for Health Research Policies of the Ministry of Health, and General Coordinator of the Advisory Council on Science of the Mexican Presidency. He is an emeritus member of the National System of Investigators, Mexico and a member of El Colegio Nacional. From 1966 to 1970 he was associate scientist at the Institute for Cancer Research, Villejuif, France. In Mexico he has been a researcher at the National Institute of Cardiology, director of the Mexican Programme for the Study of Parasitic Diseases (Rockefeller and Mac Arthur Foundations, WHO), and President of the Mexican Academy of Sciences and of the National Academy of Medicine.

References

Frenk, J. 2002. Paper presented in the XII Roundtable of the Mexican Government, *The Economist* and TV Azteca, 25th June, 2002.

Frenk, J, Sepúlveda, J, et al, 1997. 'The future of world health: The new order and international health'. *BMJ*, 314: 1404.

Fundaciún Mexicana para la Salud. 2003. Competitividad y salud: La propuesta. Fundaciún Mexicana para la Salud, Mexico City.

Global Forum for Health Research. 2004. The 10/90 Report on Health Research 2003-2004. Global Forum for Health Research, Geneva.

Commission on Macroeconomics and Health. 2001. Report of the Commission: Macroeconomics and Health: Investing in Health for Economic Development. World Health Organization, Geneva.

Lúpez-Antuōano, F. 1993. Sal. Pub. de México, Vol. 35, No 4, julioagosto. Los Institutos Nacionales de Salud. 2003. Reseõa Historiografica de 60 aõos de logros. Los Institutos Nacionales de Salud, Mexico City. Programa de Acciún Investigaciún en Salud. 2002. CGINS, Mexico City.

UNDP. 2003. Human Development Report 2003, Millennium Development Goals: A compact among nations to end human poverty. UNDP, New York.

WHO Ad Hoc Committee on Health Research Relating to Future Intervention Options. 1996. Investing in health research and development. World Health Organization, Geneva.

World Health Organization. 1995. *The World Health Report 1995. Bridging the gaps.* World Health Organization, Geneva.

World Health Organization. 2004. The World Health Report 2004, 'changing history'. World Health Organization, Geneva.

Health research and the Millennium Development Goals

Article by Gerald T Keusch

The advent of the millennium has helped to focus attention on a set of unsolved global problems that, without effective interventions, threaten the health and welfare of the world's population. Leadership at the United Nations has created a set of Millennium Development Goals (MDGs), addressing poverty reduction through specific targeting of potentially achievable endpoints by the year 2015. A number of the MDGs are health goals, and it is these that this paper will focus on.

The burden of ill health

Although there are many problems in accurately reporting the burden of ill health in terms of both mortality and morbidity (including the consequences of long term survival with a disability), there is little doubt that the burden of ill health is unequally distributed between nations around the world. To a large extent this maps to wealth, however it is also clear that within nations there is an unequal distribution of ill health between those at the high and low ends of income. In short, wherever there are people, poverty and ill health go together. If the MDGs are to lead to improvement, there must be some benchmark to measure the impact of interventions and to monitor progress.

Perhaps the easiest statistic to collect is cause-specific mortality – a death is, after all, a death. However, capture of all deaths in a demographic system, careful and accurate classification of the cause of death, and avoidance of double counting is in reality incredibly difficult. While some might argue it is better to spend resources on better healthcare to reduce mortality, and not in the development of surveillance and health information systems, without the guideposts provided by mortality data it becomes difficult to effectively prioritise and target resources, which will always be limited in amount.

However, mortality does not tell the whole story. The creation of measure that include mortality data expressed as years of life lost prematurely, plus years of life lived by survivors with a resulting disability, weighted according to agreed upon criteria, has been highly revealing. The use of one such measure, the Disability Adjusted Life Year or DALY, adopted by the World Health Organization as its principle metric, reveals that unipolar and bipolar depression, together with psychoses, will become the leading cause of DALY losses by 2020, exceeding that of any infectious disease —

Millenium Development Goals

- Eradicate extreme poverty and hunger
 - Halve the proportion of people with an income
 <1\$/day or who suffer from hunger
- Achieve universal primary education
 - All children, everywhere, boys and girls, complete a full course of primary education
- Promote gender equality and empower women
 - Eliminate gender disparity in primary and secondary education by 2005 and to all levels of education no later than 2015
- Reduce child mortality
 - · Reduce by two-thirds the under five mortality rate
- Improve maternal health
- · Reduce by three-quarters the maternal mortality rate
- Combat AIDS, malaria and other diseases
 - Have halted and begun to reverse the spread of HIV/AIDS and have halted and begun to reverse the spread of malaria and other diseases
- Ensure environmental sustainability
 - Integrate the principles of sustainable development into government policies and programmes and reverse the loss of environmental resources
 - Halve the proportion of people without access to safe water and sanitation
 - Achieve a significant improvement in the lives of at least 100 million slum dwellers by 2020
- 💠 Develop a global partnership for development
 - Further develop an open, rule-based, predictable, non- discriminatory trading and financial system
 - Address the special needs of the least developed, landlocked, and small island nations and states
 - Deal comprehensively with the debt problems of developing countries
 - Develop and implement strategies for decent and productive work for youth

assuming, of course, that the incidence and consequences of infectious diseases decreases progressively during this period of time and we are able to stem the impact of emerging and re-emerging infectious diseases. That goal of reducing the impact of infectious diseases may be achievable by the use of vaccines, and the effective implementation of basic public

health and healthcare delivery systems, and of course these, and other, strategies are implicit in the health specific MDGs, together with education, empowerment of women, and effective government. There is, for example, little doubt, that disease-related morbidity and mortality is highly significantly related to the overall nutritional status of infants, children adults and the elderly, and the adequacy of vitamin A and zinc nutrition and undoubtedly other macro- and micronutrients as well. Thus, the health and non-health MDGs are mutually supportive.

The changing paradigm of development

For many years, the paradigm of development has been investment in the economic sector. The hypothesis was that, by creating wealth through economic growth, the gains would trickle down and improve the ability of those lower and lowest on the income scale to purchase better health through nutrition and healthcare. There is considerable evidence to indicate that, while wealth is created through such investments, there is a major hang-up in the trickle down. Hence those at the very top become much richer, many below them move into a middle-class status, but those lowest on the scale remain hopelessly behind. Only recently has it become clear that economic growth is dependent on the health of the workforce. This makes sense, as sick workers cannot work as hard on the job as the healthy, and will miss more work due to more days of illness, and because the quality of the workforce is also dependent on cognitive ability, which is a reflection of normal growth and development to the full genetic potential of an individual during the early years of life, and probably continuing along the life cycle. This is becoming clear in the context of HIV/AIDS, as the investments by industry in both skilled and unskilled workers are being lost through morbidity and mortality due to HIV/AIDS. Indeed. there are increasingly convincing data that it is cost-effective for business to invest in both preventing and treating HIV, especially for skilled workers trained up to perform more difficult and problem solving tasks.

Implementing what we know or investing in new research?

There is always debate when resources for health are limited whether it is better to reserve all available funds for implementing current modes of intervention or to invest a portion of the healthcare budget in generation of new knowledge. Those who are convinced of either version are unlikely to be convinced to change their views, regardless of the argument. The most recent careful analysis of this, and many of the points made above, are to be found in the report of the Commission on Macroeconomics and Health, and the working paper series of its six working groups (all available online at www.cmhealth.org).

Concomitant investment in health research along the spectrum from basic to applied, together with funding of healthcare delivery systems, is seen as the best way to have

both short- and long-term impact. Biology is not stagnant; much changes over short periods of time, and much that is new will happen over short periods of time. Hence it is inherently simplistic to think that all problems in the future can be addressed by using the solutions of the past. HIV and other emerging infectious disease are good examples of this. In the case of HIV had there not been decades of investment in the study of retroviruses, a curious phenomenon of nature and (it was thought) of no relevance to human disease, the cause of HIV and a diagnostic test could not have been identified in the first few years after its discovery and emergence. Continuous improvement in vaccines produces better products with less adverse effects. A case in point is the development of acellular petussis vaccine. Research has also led to development of drug therapy for many complex, non-communicable, chronic problems, such as diabetes and cardiovascular disease. Improvement in overall health, measured as longevity at birth, has been highly dependent on the introduction of new strategies, new drugs, and new medical products emerging through a research pipeline. What remains in doubt is how to insure that the products of research are available to the poor at affordable prices.

Promoting appropriate research

There have been a number of reports in the past 15 years addressing the issue of research. The Global Forum for Health Research was created to address the gap between research investments of high and low income countries, following earlier studies which had estimated that 90% of research investments were being focused on diseases affecting 10% of the world's population, primarily living in rich countries – the so-called '10/90 gap'. As WHO has pointed out in its annual World Health Reports, the health gap between rich and poor is continuing to widen.

To change this we need to achieve a new way to promote relevant research. First of all, health research in the academic sector is focused on the generation of knowledge and its dissemination. Researcher's careers and the rewards of a research career are dependent on obtaining the funding to conduct research and on publishing their research results. This has been cynically characterised in the academic world as 'publish or perish'. At the same time, considerable health research is conducted in the private for-profit sector, to guide the development and commercialisation of drugs, devices and other products to sell to combat disease and improve health. Here the academic paradigm might be made relevant to researchers working in the pharmaceutical industry by a slight change in the phrasing, that is 'produce or perish'. Neither of these cultures is optimal; both need to interact more effectively to not only move along the knowledge generation-dissemination pathway, but to extend the road to the application and implementation of knowledge. Only when the goal of research is to both create new knowledge and achieve product delivery will we be able to make more rapid progress. The involvement of the public sector in this seems

to be essential, given the costs involved and the interest of all in the creation of public goods through public investment. Thus, the development of an increasing number of public-private partnerships over the past decade is a hopeful sign of change for the better.

Another necessary step seems to me to be the reduction of inefficiencies built into the present research system. These include the failure of the research system to ensure the free and open and universal communication of research results and to resolve the important barriers that intellectual property patenting and licensing can erect to move ahead with product development; and the tendency to focus on competition rather than collaboration, leading to unnecessary duplication and the failure to share in real time information and experience that guides progress.

The Commission on Macroeconomics and Health called for the creation of a global research initiative to break through these barriers between academics, between the public and private sector, and between nations. An attempt is currently being made to develop a virtual collaborative among the stably funded national health agencies, such as the medical research councils in high, middle and low income nations that support such agencies. The barriers to overcome include identifying mechanisms to permit close collaboration without the need to invest through a common fund or create new mechanisms for funding, to coordinate research activities according to a prospective plan, and the need to limit the adverse impact of intellectual property on access to technology. This initiative has focused on the national research agencies, since they are oriented to the production of

the highest quality research output, merit based funding, and systematic priority setting based on scientific feasibility and need and not profit. The plan is a virtual organisation, made real by the commitment of the scientific leadership of these institutions to the collaborative. This process was initiated at Forum 6 of the Global Forum for Health Research (Arusha, 2002) and may, with hard work and considerable good will, take shape at Forum 8 of the Global Forum for Health Research (Mexico City, 2004).

Conclusion

Health is central to human development. Research is central to health, but it can only contribute to health improvement when products spin out of the work in real time. New ways to create a culture of science linking knowledge generation to its application and implementation, and new ways to link individuals and institutions involved in research, can be expected to support the development of healthcare delivery systems throughout the world, with perhaps the greatest impact on those most excluded from benefiting from the present system. \square

Gerald T Keusch, a graduate of Columbia College and Harvard Medical School, is presently Professor of Medicine and International Health, and Provost and Dean for Global Health at Boston University Medical Campus and School of Public Health. Dr Keusch is Director of the Global Health Initiative at Boston University. He formerly served as Associate Director for International Research and Director of the Fogarty International Center at the US National Institutes of Health.

The case for mobilising new research behind the health Millennium Development Goals



Article by Mariam Claeson, Adam Wagstaff, Eduard R Bos, Phillip Hay and Jacques Baudouy (pictured)

he 1.3 billion people living on less than a dollar a day, as well as other grave distortions of global equity, were the driving force behind the Millennium Development Goals (MDGs), which now form a defining manifesto for the international development community. Of the eight MDGs, at least half address health on account of the staggering scale of preventable death and curable ill health among poor people in the developing world, and how this phenomenon encroaches on improved, sustainable economic development. These challenges, integrated into the targets for the health MDGs, could not have been clearer, but what progress has been made to date? The answer suggests mixed results.

In the 1990s, 38% of countries managed to reduce the numbers of deaths of children under the age of five years, despite the inexorable presence of HIV/AIDS. In two regions – East Asia and the Middle East and North Africa – the number of mothers dying from pregnancy-related complications fell swiftly during the 1990s.

As welcome as these indicators are, there is plenty of bad news as well. Progress in reducing under-five mortality has been much too slow, and has become markedly slower in the 1990s, compared to the 1980s. Sub-Saharan Africa (SSA) is lagging badly behind on all the health MDG targets, but especially on under-five mortality reduction. Research shows that the poorest countries are most vulnerable to falling short of their targets, and within all countries, poor people are similarly most at risk of losing out on the broad improvements in health and human welfare heralded by the MDGs.

Looking ahead, progress in the second half of the 1990–2015 window will not necessarily be swifter. Some positive impetus will come from outside the health sector in the form of increased economic growth.

The MDG agenda may well speed up progress towards universal primary enrolment, the elimination of gender gaps in secondary education, and better access to safe drinking water. But even in the most optimistic calculations, the combined effects of these factors will not be enough for most countries to hit their MDG targets.

Given the slow progress achieved on health MDGs, the case for mobilising an intensive, expanded research agenda behind the 2015 targets becomes urgent, and unavoidable.

In its recent report - The Millennium Development Goals

for Health – Rising to the Challenges – the World Bank identified a number of measures which countries and the international development community could take to speed up their progress towards meeting the Millennium Development Goals (World Bank, 2004). Some of these steps, such as key research priorities and pointers, may be usefully summarised in the following account, including methodologies to increase utilisation of effective interventions to reach the MDGs, and evaluate the optimal mix of spending, policies and institutional reform. Several health systems research questions are also posed, as well as a number of recommendations on how countries and their development partners can best absorb the lessons of development assistance for health.

Increasing the use of effective interventions – especially among poor people

Effective interventions exist for malnutrition, child mortality, maternal mortality and communicable diseases. Tragically, they are not being used by the very people who can benefit most from them – the poor especially. If universal coverage rates of a handful of key child health interventions could be achieved, their impact could be beneficial: under-five deaths worldwide would fall by nearly two–thirds, ensuring the MDG target is met (Jones et al, 2003). Maternal mortality rates would fall by three-quarters, thus meeting the MDG target, by 'scaling up' a handful of key maternal mortality interventions such as improved access to comprehensive obstetric care (Ramana, 2003).

The 'technology' is available – but it must be used by everyone. The focus of research and evaluation has to shift from intervention effectiveness studies to programmatic effectiveness and impact evaluation, in order to best influence policies and actions. We need new research to investigate why people fail to get the effective interventions they could benefit from so greatly. This will be important to better design programmes aimed at increasing coverage.

Evaluating the optimal mix of spending, policies and institutional reform

While additional resources are most assuredly needed, these will not be sufficient to help countries reach their MDGs.

In countries with very weak governance, across-the-board increases in government spending will have little if any impact on MDG indicators (Filmer and Pritchett,1999). In these countries, improved policies and institutions – within and beyond the health sector – are crucial if progress towards the MDGs is to be accelerated. Health systems research, monitoring and evaluation need to focus on policies and institutional constraints, starting with defining them at national and sub-national levels.

Target and remove key bottlenecks

Even in countries with relatively good policies and institutions, additional government health spending needs to be targeted. This can be done along various lines such as geography (poor regions, for example), level of facility (intermediate facilities rather than tertiary hospitals), and type of programme (public health programmes).

Targeting can also involve identifying the roadblocks that countries face in reducing mortality, and then focus resources on removing them. Preliminary estimates suggest the returns on such spending – in terms of mortality reduction – are a good deal higher than the returns to across-the-board increases in government health spending.

One approach to targeting obstacles that is being developed and applied in different countries and situations is 'marginal budgeting of bottlenecks' or MBB (Soucat et al., 2002). This approach requires more research and evaluation, scientifically validating impact models for all the MDGs, the proposed delivery systems, the process for identifying key bottlenecks, and the costing methodology.

Leading health systems research questions for accelerating progress on the health MDGs Strengthening policies and institutions in the health sector

Strengthening policies and institutions in the health sector requires looking closely at a number of critical issues:

- What are the financial and non-financial barriers that households face in their dual roles as producers of health and users of health services? Cost is paramount especially for the poor, but knowledge and geographic access are equally important.
- How can policy makers and clients improve the performance of health providers - on quality, responsiveness and efficiency - through increased accountability? Within provider organisations, stronger management involves increasing the accountability of frontline providers to the organisation. But their performance can also be improved by making provider organisations more accountable to the public, whether along the direct route (for example, enabling community organisations to exercise oversight of providers) or the indirect route (making providers more accountable to policymakers through, for example, contracts or agreements, and making policy-makers in turn more accountable to the public through greater democracy and openness). Analysis of service delivery modalities reveals a lot of ignorance about the effectiveness of the various approaches. Political prejudice more often drives the subsequent debate than hard evidence because too

- little effort has been invested in strengthening the evidence base. Impartial research is needed to evaluate the effectiveness of the various approaches, and how it varies according to local conditions and circumstances.
- ♣ How to ensure adequate human resources for health? The numbers of healthcare workers are often low, their skills and productivity inadequate, with high absenteeism. Most developing countries face problems with finding enough skilled staff to undertake key functions (World Bank, 2003), sometimes because of large migrations. In response, policy–makers need to explore different policy options, investing in more 'learning by doing,' shifting the focus from descriptive problem analysis to intervention studies that evaluate a mix of interventions that narrow compensation differentials, improve the skills mix, provide other incentives, and will help address this public health crisis (Peters et al, 2002). Research must go hand in hand with innovative approaches.
- ♣ How to get effective and appropriate drugs to the frontline? In the area of medicines and essential supplies, governments again face challenges, most clearly in ensuring that medicines reach and are affordable to people who need them most. This means working to improve logistics and procurement arrangements at the country level. It also implies a greater and more responsible role for industrialised governments in making existing drugs available at affordable prices and providing the appropriate incentive environment for research and development into diseases that disproportionately affect poor countries.
- What are the core public health functions and how to address the gaps? Another important but all too often neglected area is public health. Many governments lack credible, adequately financed strategies for preventing, treating, and controlling communicable diseases. Too little effort is devoted to surveillance, monitoring, evaluation, and other core public health functions, absorbing the lessons of these activities, and incorporating them into policymaking (World Bank, 2002).
- ❖ What are the major inter-sectoral synergies and how to work efficiently cross sectors for better health? Often inter-sectoral issues are poorly handled. Yet, as has become increasingly clearer, investments outside the health sector (in, for example water and sanitation, roads and transport) do not achieve their full health impact, unless they are accompanied by well-designed programmes that aim to change people's behavior such as hand-washing or seeking help and care from services that are available.
- ♣ How to finance additional spending for the MDGs in a sustainable way? Reforming policies and institutions, building stronger health systems, cannot be done overnight, and requires stepped-up financial and technical resources. Implementing policy also requires resources. But at a given level of per capita income, there are some countries that appear to spend less than they can afford. In these countries, governments should

consider raising the share of government spending in GDP, or increasing the health share of total government spending. Governments need also to play a stronger role in encouraging or arranging the pooling of out-of-pocket expenditures through insurance and prepayment.

Learning the lessons of development assistance for health

Donors also have a role to play in the process of improving policies and institutions in the health sector, and in raising the amount of resources flowing to the health sector. But donors have to do better than their previous track record shows. Important lessons need to be learnt. Development assistance in health is too unpredictable, and the transaction costs are too high. This calls for more effective donor coordination, the pooling of aid funds, and allowing developing countries to set and drive their development aspirations. Global partnerships in health most certainly add value, but they also carry risks.

At a High-Level Forum (HLF) on the health MDGs in Geneva in January 2004 (High Level Forum, 2004), a broad coalition of development partners - donors, international technical agencies, philanthropists, and developing countries - agreed that the health MDGs indeed posed formidable challenges, and that urgent solutions were needed to overcome them in time for the maximum number of poor countries to reach the 2015 targets.

The HLF participants agreed on steps to mobilise resources for health, to improve aid effectiveness, harmonisation, human resources, and to monitor performance. In each of these areas, research and evaluation are integral elements:

- Countries should have one single process leading to MDG-responsive Poverty Reduction Strategy Papers; more operations research to help document needs and provide realistic and feasible costing scenarios.
- Globally, lessons should be drawn from in-depth human resource analysis in developing countries, and from research on how to address the current stock and deployment of health personnel, and the requirements to meet the MDGs.
- Agreement has to be reached on a set of intermediate

indicators and definition of policy and institutional performance indicators to gauge progress towards the health MDGs. And, efforts need to be made to track financial investment in health from both domestic and external sources using national health accounts and other financial flow data. This provides an entry for more indepth research into the performance of health systems and financing that would be of immediate value to the development community.

In summary, to help as many countries as possible speed up their progress towards meeting their health-related MDGs, implementation must go hand-in-hand with monitoring, evaluation and research. Improved monitoring and evaluation can help identify key constraints and research priorities, while a strong MDG-relevant research agenda will in turn inform policies and actions - a reiterative process. Increasing coverage with effective interventions, identifying and targeting the constraints in health systems to faster progress, such as the performance of health workers, and the overall lack of healthcare workers and life-saving drugs and medicines these are some of the basics of an intensive, expanded development research agenda that could well provide the impetus for the many countries presently "off-track" for meeting their MDG targets, ultimately to succeed in their quest to transform the human welfare for their neediest people.

Jacques Baudouy is the Director for Health, Nutrition and Population at the World Bank.

Eduard Bos works on health and demographic statistics and monitoring and evaluation in the World Bank's Health, Nutrition and Population Department.

Mariam Claeson is a Lead Public Health Specialist in this Department, where she is currently working on health-related MDGs.

Phillip Hay is Communication Advisor for the Human Development Network of the World Bank.

Adam Wagstaff is a lead economist working on health issues in the World Bank Development Research Group.

References

Filmer, D., Pritchett L. 1999. 'The impact of public spending on health: Does money matter?' Social Science and Medicine 49 (q10): 1309-1323.

High Level Forum on Health MDGs, Geneva, 2004. http://www.who.int/hdp/en/summary

Jones, G, Steketee, RW, Black RE, Bhutta ZA, Morris SS. 2003. 'How many deaths can we prevent this year?' Lancet 362 (9377): 65 - 71.

Peters D.H., Yazbeck.A.S., Sharma R., Ramana G., Pritchett L.H., and Wagstaff A, 2002. Better health systems for India's poor: Findings, Analysis and options. Washington DC. World Bank.

Ramana, G. 2003. Attaining the Millennium Development Goals for Maternal and Child Health by Selected Indian States. Processed. Health, Nutrition and Population dept, World Bank.

Soucat A., Van Lerberghe W., Diop F., Nguyen S., Knippenberg R. 2002. Marginal Budgeting of Bottlenecks. A new costing and resource allocation practice to buy health results. World Bank, DC.

World Bank, 2002. Public Health and World Bank operations. Human Development network, World Bank, Washington DC.

World Bank, 2003. World development Indicators 2003. World Bank, Washington DC.

World Bank. 2004. The Millennium Development Goals for Health, Rising to the Challenges. July, 2004. World Bank, Washington DC.

Affordable, essential new health technologies: a view from the Rockefeller Foundation



Article by Gordon Conway (pictured) and Charles Gardner

he Rockefeller Foundation is committed to achieving lasting improvements in the lives of poor people by working with and for them to ensure that they are included among globalisation's beneficiaries. To do so, we provide grants to help eradicate poverty and hunger, minimise the burden of disease, improve employment opportunities, increase the availability and quality of housing and schools, and stimulate creativity and cultural expression.

Our health strategy derives from our broader mission to reduce avoidable and unfair differences in the health status of populations. While tremendous advances in medicine have made it possible for all people to live longer, healthier lives, these benefits have not been distributed evenly. Poor people in both poor and rich countries suffer a far greater burden of disease.

The Foundation addresses health disparities by focusing on three areas:

- building health systems capacity;
- improving access to existing health tools and services at the family level (especially for HIV/AIDS); and
- the development of new tools to improve access.

New drugs and vaccines could speed progress towards and increase the effectiveness of global efforts to achieve the Millennium Development Goals (MDGs). They are thus a necessary but still insufficient means to reduce the burden of disease for the poor and excluded. For this reason, the Foundation has pursued complementary efforts in health systems through a 'Joint Learning Initiative' to bring increased understanding and attention to - and recommend action on the roles and needs of human resources for health. In addition, the Foundation has developed programs in HIV/AIDS prevention and care, including for example 'MTCT +' to reduce mother-to-child transmission of HIV and provide appropriate treatment for the mothers.

The need and the means

During the 1990s, the Foundation shifted its focus away from basic research on neglected diseases to tackle a serious but poorly addressed global health failure: the glaring absence of new products for diseases of the poor. Product development pipelines for such diseases were nearly empty while treatment and prevention measures were either nonexistent (e.g., HIV vaccines and microbicides), inadequate in the face of expanding epidemics and increasing drug resistance (e.g., AIDS, TB and malaria) or entailed such cumbersome infrastructure and lengthy treatment that it would be impossible to reach, treat and cure all those in need (e.g., TB).

The Foundation's strategy now seeks to leverage private sector expertise to meet shared public priorities through the creation of public-private partnerships (PPPs) to accelerate development of drugs and vaccines for diseases of the poor. Our faith in this model as a means to address health disparities is borne out by a recent review. We now expect to extend the programme's focus to explore health innovation within developing countries.

Global product development PPPs

The Foundation chose disease-product priorities based on expert assessment of a combination of high social demand and maturity of the science. Globally-based non-profit product development PPPs (PD PPPs) were then developed as a programmatic instrument to:

- link public sector goals with private sector know-how as a means of accelerating drug and vaccine development for neglected diseases;
- raise awareness of global health inequities and attract substantial new funding to the field; and
- promote 'culture change,' incorporating methods and models from the private sector into public sector practice, and encouraging more private players to enter the field of neglected diseases.

Built into every aspect of these organisations is a focus on ensuring that products are ultimately affordable and accessible to the poor. Products have been selected based on low manufacturing cost and ease of delivery, intellectual property has been used to provide incentives for private participation, and location of manufacturing in developing countries may be considered to reduce cost. And importantly, a series of partnerships have been created to deliver products

Each PD PPP would seek to deliver products that will be cheaper and easier to supply than existing prevention or treatment methods. For example an HIV vaccine would replace expensive HIV drug treatments. A shorter-course TB treatment regimen would replace the existing, six to nine month regimen. As these new products replace current interventions with more 'efficient' methods, they could provide greater access to health among those now suffering from, or at risk of, disease.

Key features of the global PD PPP field

The Rockefeller Foundation has provided seed funding that was instrumental in the creation of the International AIDS Vaccine Initiative, Medicines for Malaria Venture, Global Alliance for TB Drug Development, International Partnership for Microbicides and Pediatric Dengue Vaccine Initiative. Other organisations working over the same period moved forward with the creation of a Malaria Vaccine Initiative, Aeras Global TB Vaccine Foundation, Foundation for Innovative New Diagnostics, Drugs for Neglected Diseases Initiative, Institute for One World Health and others. These PD PPPs owe their continued financial well-being to donors such as the Bill & Melinda Gates Foundation, other philanthropies, government development agencies and multilateral organisations.

PD PPPs are helping to bridge the gap between basic research and product development. They have begun to align public health goals with private sector know-how. They have brought attention to the health product needs of poor people in developing countries. And many of these organisations have taken on the role of advocacy for greater resources to the field. To varying degrees, all use business practices in staffing and in managing a portfolio of candidate products. Differences among PD PPPs result from technical differences in product development, the extent to which a portfolio approach is used, the disease focus and the global commitment to that disease, and the extent to which they work with other partners to ensure procurement, delivery and use of successful products.

Portfolio management, a concept borrowed from industry, is a key distinguishing feature of the new field. To the extent that the public sector pursued product development in the past it tended to follow a linear academic approach. Portfolio modelling makes it possible to estimate optimal portfolio size, and to predict how much time and resources will be needed to ensure a high probability of success. Since most drug or vaccine candidates will fail somewhere along the development process, portfolio management also helps to insulate donors from risks inherent in selecting individual projects.

Most PD PPPs have explicit policies affecting portfolio turnover, including a 'kill strategy' for products that do not meet milestones set out in the project's business plan, and a strategy to acquire new candidates into the portfolio. 'Go-nogo' decisions are taken by a Scientific Advisory Board made up of experts in the field in conjunction with PD PPP technical staff. For donors that do not have the depth of scientific knowledge needed to choose winners and losers from among dozens of competing technical proposals, PD PPPs are a way to 'wholesale' the tough decisions to professional experts.

Review of current status

The five PD PPPs supported sequentially by the Foundation are still young – some of them just a few years old – and engaged in a 'business' that often takes more than a decade to develop a new product. Sufficient time has not yet passed to determine whether they will achieve their ultimate goals. For this reason, in seeking an external review of its recent work, the Foundation asked for an analysis of interim indicators and organisational best practice benchmarks, as well as a survey of global health experts.

The review found that the strategy remains sound today and interim indicators are positive. For example, impressive new public sector support has arisen, and product development pipelines have expanded significantly both within and outside of PD PPP portfolios. Despite this success, still more resources will be needed to carry their work forward to subsequent stages that will include regulatory approvals, clinical trials, manufacturing and distribution.

We issue an urgent plea to all potential donors, in both the public and private sector, on both sides of the Atlantic, to join in this important effort.

Next steps: health innovation systems in developing countries

Governments of the ten most scientifically advanced developing countries collectively invest over \$2 billion dollars a year on health research. This is an order of magnitude more than all ten PD PPPs combined. Some are already major suppliers of low-cost drugs and vaccines to the poorest countries in the world, but their research institutions are capable of much more. Over the coming years, some of these countries will become significant sources of health innovation, developing new products to address local national and regional health priorities such as TB and malaria, and even the next generation of antibiotics and antiretrovirals to combat growing bacterial and HIV drug resistance.

To do this effectively, however, these countries must develop sound effective innovation systems. Many players are already involved in this effort within 'innovating developing countries' (IDCs) themselves. The Rockefeller Foundation has begun an exploration to bring together experts and organisations that have a common interest in this area to strengthen analysis and information sharing among countries, to build capacity in the varied sectors that make up national innovation systems within IDCs, and to ask how such innovation can help the least developed countries that are neighbours of the IDCs.

One area where the Foundation has already made a commitment is in bridging the gulf between the public and private sectors in the IDCs. Like PD PPPs, public research institutions in developing countries need models for partnerships with the private sector, training for technology managers, best practices to ensure access, and sound supportive institutional policies to ensure that the local public research investment leads to safe, effective, affordable and accessible products. They need capacity building in technology management to ensure the 'ethical stewardship' of essential new health technologies.

In the least developed countries, public research institutions may enter into research partnerships with Northern universities or companies, as well as with PD PPPs. Such partnerships may involve material transfer agreements, in-licensing to obtain new technologies, and out-licensing of indigenous technologies to achieve both economic and social gains. Thus, even in the poorest countries, local institutions need skills to negotiate intellectual property agreements on a level playing field to protect local interests. They could also benefit from networking with similar institutions in other developing countries, especially those that are more scientifically advanced.

Impediments to innovation in developing countries include insufficient human resources and skills for technology management, lack of networking among technology managers and insufficient transfer of knowledge from public research to the private sector. To address these issues, the Foundation created an organisation called MIHR (Centre for Management of Intellectual Property in Health Research and Development) in 2002. Its primary goal is to work with local agencies and institutions to raise the stature and build capacity among a growing cadre of technology management professionals in developing countries, enabling them to

navigate the intricacies of technology licensing to develop new products and ensure access for the poor.

Technology management in local public-private R&D partnerships is just one factor to consider in a comprehensive framework for health innovation systems in developing countries. This and other factors may be a subject for exploration for the Foundation's product development strategy for the future \Box

Gordon Conway is President of the Rockefeller Foundation, and under his leadership it has created a series of public-private partnerships to develop necessities like health products, housing and reliable sources of food and income for poor people in communities that lack access to them.

Charles Gardner manages the Rockefeller Foundation's programme to accelerate product development for diseases of the poor, and equitable access to essential drugs and vaccines, through public-private partnerships. His background covers nearly 15 years of professional experience in international health research management, bioethics and science policy, including four years in India

Diseases and health determinants

- 80 Communicable diseases: a research perspective Robert G Ridley
- **85** Fighting AIDS, TB and malaria the research imperative Richard G A Feachem
- 89 Chronic diseases: research and policy priorities Robert Beaglehole
- 93 Health research to address selected chronic disease risks Derek Yach
- 100 The economic aspects of diabetes care Sponsor's statement: Novo Nordisk
- 102 Health research for cardiovascular disease in developing countries K Srinath Reddy
- 107 Child health: how can health research make a difference? Zulfiqar A Bhutta and Seema Lassi
- 113 The current state of mental and neurological research Rachel Jenkins, Florence Baingana and Don Silberberg
- 117 Health research for sexual and reproductive health Paul F A Van Look and Catherine d'Arcangues
- 122 Sexual violence Claudia Garcia-Moreno and Chen Reis
- 125 Research on violence and injury prevention could save millions of lives every year Etienne G Krug and David R Meddings

Communicable diseases: a research perspective



Article by Robert G Ridley

istorically, limited public sector resources have been applied to communicable diseases of poverty and their associated research issues. This has been further exacerbated by a lack of market incentive for pharmaceutical industry research and development. With a few notable exceptions, most of this low level research investment originally focused on basic, academic research.

In recent years there has been a growing level of funds directed at complementing basic research with research directed toward new tool development, for example through public private partnerships, though there remains a need to better develop mechanisms to translate basic research into product development. Following a major focus on vaccine research in the eighties, greater attention turned toward drug research in the nineties and this is now being further complemented by activities targeted at diagnostics.

Most activities to date have focused on the three major diseases of HIV, tuberculosis and malaria. More needs to be done for lower profile, more neglected diseases. Also, as more new tools are developed and greater resources are applied to the scaling up of existing interventions for all diseases, more research should be directed towards developing improved disease control methodologies and strategies to ensure the optimal utilisation of new and existing tools. All research activities need to be viewed within a continuum that flows from basic research through product development to implementation driven research. Attention also needs to be paid to the growing diversity of organisations engaged in communicable disease research so that their activities can, as much as possible, synergise with each other and meet the needs of the control and development communities within the context of national health systems.

This article provides an overview of research activity and issues for communicable diseases, focusing on diseases associated with poverty. It places this research against the backdrop of disease burden, the Millennium Development Goals (MDGs) (World Bank, 2004) and the current international landscape of research.

It will: (i) cover the major communicable diseases under global consideration; (ii) describe a functional research framework to assist analysis; (iii) describe a methodology for identification of research priorities and needs; (iv) illustrate the health impact of some long term research activities and

identify some future research challenges.

The diseases

Communicable diseases, together with maternal, perinatal conditions and nutritional deficiencies, annually account for over 18 million deaths and a loss of over 600 million Disability Adjusted Life Years (DALYs) worldwide, with a disproportionate amount of this disease burden occurring in developing and least developed countries (World Health Organisation, 2004a). The dominant causes of death are HIV/AIDS, tuberculosis, malaria, diarrhoeal diseases, respiratory infections and childhood vaccine preventable diseases such as measles. This accounts for the MDG health-related focus on HIV, TB, malaria, reduction of childhood mortality and improved water sources and sanitation (World Bank, 2004).

However, it should be recognised that other diseases also have a significant global impact on the health status of communities. These include parasitic diseases, sexually transmitted diseases (STDs) and a variety of viral infections such as hepatitis. In many cases these diseases, notably STDs and parasitic diseases such as leishmaniasis, schistosomiasis and lymphatic filariasis, result in chronic infections that have a higher impact on disease burden, measured by DALYs, than mortality data alone would predict. The localised nature of these diseases and their close association with impoverished communities at the periphery of healthcare systems demand that these diseases also receive serious consideration if we are to have a sustainable impact on poverty and poor health (World Health Organisation, 2004b).

Another class of disease having an important impact on global health over and above its level of disease burden is that of emerging infectious diseases. These mainly viral infections are illustrated by outbreaks such as SARS, the vector borne flaviviruses, e.g. West Nile, and the hemorrhagic viruses, e.g. ebola. These emerging infections require enhanced surveillance and monitoring systems to prevent their establishment within populations. They are increasingly becoming related operationally to the risk associated with the intentional creation of re-emerging infectious diseases and biodefense. They will not be dealt with in detail in this paper.

A common feature of communicable diseases is that, even

when tools for their containment are available, factors can conspire to convert them into re-emerging infectious diseases. These factors can include environmental changes, managerial and societal changes, failures in policy and genetic changes such as those that generate drug resistant strains of organism or insecticide resistant vectors. Innovative research and training is necessary to optimise and improve on tools, methodologies, strategies and their implementation for the sustainable control, prevention and elimination of communicable diseases.

Concept of use-inspired research continuum

It is important to recognise the vast array of research activities and methodologies that are necessary to provide sustainable support and innovation to fight disease. Many analyses restrict the impact of research as being one of developing new tools such as vaccines, drugs and diagnostics and then 'implementing' those tools. The lack of effective tools for some diseases and the rise of drug and insecticide resistance explain this focus. However, a more complex research dynamic is operating to deliver a health impact.

A continuum of activities leads to improved health outcomes. Upstream strategic research feeds into basic knowledge and discoveries that lead to ideas for new products. To realise this innovation, product development must be undertaken. This requires partnership with the pharmaceutical industry and significant planning around the ultimate production, manufacture, distribution and commercialisation of the product. New and improved pharmaceutical interventions. together with pharmaceutical interventions, have to be utilised in control methods optimised and assessed for use in real-life situations at the clinical and community levels. Multiple products might be combined within such optimised methods (e.g. combinations of drugs or integrated use of drugs and diagnostics). Finally, optimised and validated prevention and control methods feed into strategies for large-scale implementation that provide guidance for application in national settings. These activities are continuously informed by strategically driven research and the management of knowledge - non-clinical, clinical, epidemiological, social, economic and behavioural. To be sustainable within a health system, research activities should be undertaken side by side with appropriate capacity building.

Research prioritisation: identifying gaps and needs

It is self-evident that the priority needs of use-inspired research for different diseases are not the same, but it is rare that an overview of research needs across infectious diseases is attempted. One such attempt was made recently by the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) for the ten major diseases within its portfolio, namely malaria, TB, dengue, leprosy, African trypanosomiasis, Chagas' disease, leishmaniasis, schistosomiasis, lymphatic filariasis and onchocerciasis (Remme et al. 2002).

The exercise took as its starting point the prioritisation

framework developed by the Global Forum of Health Research (Global Forum of Health Research, 2002). For each disease, an analysis was undertaken, based on literature evidence and in consultation with a reference group of experts.

With regard to epidemiological trends, three main categories emerged:

- Category 1: the epidemiological situation is getting worse and the incidence of infection and disease is on the increase (e.g. African trypanosomiasis, leishmaniasis and dengue);
- Category 2: the epidemiological situation has greatly improved in some regions of the world but is stagnant or getting worse in others (e.g. schistosomiasis, tuberculosis and malaria);
- Category 3: the global burden is on the decline as a result of effective control measures (e.g. leprosy, Chagas' disease, lymphatic filariasis and onchocerciasis).

The publication by Remme et al. (2002) gives a full analysis of each disease, including a summary of principal control strategies, the main problems and challenges for control, and the corresponding research needs.

Case-finding and treatment, often in combination with active surveillance, is the core intervention for some diseases e.g. malaria and TB, while for others the main intervention is based on mass treatment of total populations at risk in defined endemic areas e.g. leprosy and onchocerciasis. Treatment is a key element of the intervention strategy for most of the tropical diseases except Chagas disease and dengue, which are mainly based on vector control.

For several diseases, e.g. African trypanosomiasis, the predominant problem is the lack of effective and affordable control tools: available drugs are toxic, expensive, not very effective or losing their effectiveness because of increasing drug resistance; diagnostics have poor performance or practical limitations; and effective vaccines do not exist. For others, effective tools do exist, even if far from perfect, and the main problems relate to poor implementation, poor access and the challenge of sustaining control. The principal output needed from research on these diseases is new and improved control methods and implementation strategies, with the emphasis depending on the disease.

The analysis highlighted the strategic differences between the disease categories for Category 1 the main emphasis is on new basic knowledge for innovation and discovery while for Category 3 it is on new and improved strategies. These patterns are not exclusive: Category 3 has also some strategic emphasis under new basic knowledge for discovery but these are focused on specific needs, e.g. on identification of macrofilaricidal drug targets for lymphatic filariasis and onchocerciasis, and diagnostic targets for use in leprosy elimination. Category 2 diseases require a broad range of research activities from basic knowledge generation through new tool development to new and improved strategies.

Recent progress and new research directions

We should take note of some major successes over the past

decade and the near-term promise provided by recent scientific developments. Some diseases of interest, in which TDR has been proud to partner progress, include:

Onchocerciasis: the development of ivermectin for treatment and its incorporation into control through community directed treatment has drastically reduced the disease burden over the last decade (Remme, 2004). Continued advances are occurring with the development of a diagnostic to detect infection for improved monitoring and surveillance and the drive to discover and develop a macrofilaricide that would enable us to consider the targeted elimination of the disease. A potential macrofilaricide, moxidectin, is about to enter phase 2 studies in a collaboration between Wyeth and TDR, and several early stage drug discovery projects show promise.

Malaria: at first sight, the malaria situation has not improved much over the past decade. However, appropriately directed research has provided evidence for the move away from chloroquine, an increasingly ineffective drug due to resistance, to artemisinin combination therapy (Babiker et al., 2004). Research has also provided evidence for insecticide treated bednet use and has provided a focused emphasis on directing the management of malaria closer to the home rather than relying on (often distant) pubic health clinics

The complexity of issues associated with the uncharted territory of scaled up anti-retroviral use in resource poor settings requires the integration of a strong operational research agenda into scaling up activities

(World Health Organization, 2003). Without these approaches the malaria situation and outlook could be much worse. The malaria outlook is further brightened by the improved portfolio of new drugs in the pipeline due to public private partnership e.g. through the Medicines for Malaria Venture. However, more research to assess how best to place the increasing number of drug options within a public health policy context is required. A novel concept under evaluation by a Gates-sponsored consortium is that of intermittent treatment of infants under the aegis of immunisation programmes to reduce the chances of death in the first year of life (IPTi Consortium, 2004).

Leishmaniasis: until recently the outlook for leishmaniasis control was bleak. Recently the first oral drug for the treatment. of visceral leishmaniasis (VL), miltefosine, has been developed (Sundar et al., 2002), a further parenteral drug, paromomycin, is in late stage development and several diagnostic tests have been validated. These new tools, combined with possibilities for vector control, open up the possibility of VL elimination, especially in the Indian subcontinent, and open up new opportunities for control of other forms of leishmaniasis.

Sexually transmitted diseases: the focus on STDs is heightened by their link as a risk factor in HIV transmission. Antibiotics to treat bacterial STDs are available but a major drawback in developing countries has been a lack of validated point of care diagnostic tests. A recent multi-country evaluation has validated several point-of-care tests for syphilis, which opens up additional possibilities for the control of congenital syphilis. Validated point-of-care tests are still required for gonorrhea and chlamydia, but some promising tests are in development.

HIV/AIDS: because of the lack of access to treatment due to both cost and poor infrastructural support, the fight against HIV/AIDS has focused on preventive measures. However, several recent initiatives to lower the cost of treatment, combined with increased political will and resources have now made access to treatment a possibility, as exemplified through several initiatives, including the '3 by 5' initiative. The complexity of issues associated with the uncharted territory of scaled up anti-retroviral use in resource poor settings requires the integration of a strong operational research agenda into scaling up activities. It also requires well-defined prospective research to address potential downstream issues that may arise and to ensure that treatment interventions synergise with prevention-based activities within the broader context of health systems. Consultations around such a research agenda have been initiated.

The examples above focus on recent progress and near term outputs from research that could deliver a significant health impact. However, it should be stressed that many of these achievements have been built upon a strong foundation of basic research and strong research capacity. The Millennium Development Goals form a useful focus for health goals and research activities in the near term, but for a sustained impact we must continue to look ahead to innovations that could arise after 2015.

Amongst these innovations, as part of the continued search for new and improved tools, is a continued need to research into vaccines. Technical difficulties limit the prospect of vaccines for HIV, TB, malaria and parasitic diseases in the short term. However, while we strive to discover, develop and deliver new drugs, diagnostics and insecticides and to investigate new methods and strategies that can integrate new and existing tools into effective use, we should not forget the need to invest in innovative science that could provide us with tools that would truly revolutionise how we fight disease.

Much has been invested in genomic research and the fruits of this activity are beginning to be realised in terms of new approaches to new tool discovery. Numerous technological advances occur daily in many fields of endeavour. We should continuously be open to new ideas and opportunities that arise from this activity and be prepared to make high-risk investments for potentially high impact pay offs. In addition to new vaccines, drugs and diagnostics, other innovative possibilities for the future include genetically modified insect vectors that are incapable of transmitting disease. We need to pursue such possibilities whilst being continuously mindful of their ethical, legal and social implications and the difficult issues posed by the implementation of such a technology.

We should also be aware that innovation is not the sole domain of the laboratory scientist. For example, the development of insecticide treated bednets was of high impact but did not require investment in high technology. Intermittent preventive treatment of malaria in pregnancy and infants may,

through an improved methodology, have a major impact on disease mortality. As more resources become available to scale up interventions such innovation will be increasingly required to develop new and improved methods and strategies to fight disease. Increasingly these methodologies and strategies will need to be better integrated within health systems rather than be promoted as isolated, stand-alone activities.

Concluding remarks

Research across the continuum outlined in continues to be required for most diseases of interest to public health, though prioritisation may differ depending on the status of the disease.

Within this continuum of research activities there is a tension that is particularly apparent in diseases associated with poverty. The tension arises between the 'push' that comes from research innovation, where there is a drive from investigators and organisations to realise the vision of scientific opportunities, and the 'need' of disease control prioritisation for new tools and methodologies to be appropriate for resource poor settings and to fit in with existing practices of health systems. New tools and methods ideally need to be introduced and implemented in a way that synergises with, rather than distorts, the rest of the health system.

The challenge facing the large number of organisations undertaking, funding and governing a myriad of research activities is to help provide a system whereby: (i) innovative research results and new knowledge can be properly resourced, developed and evaluated; (ii) evidence-based

solutions can feed into disease control in a structured way that takes into account the broader needs of the health system. This has to be done against a backdrop of inadequate resources and weak infrastructure, both for research and

There is a growing number of research organisations, each with its own mission and prioritisation processes, that identify what they can fund and how. The resultant increase in activities is to be welcomed, but we should also realise that this increase does not, in itself, automatically provide the best-directed research to meet the health needs of developing countries. Without hindering innovation and ingenuity we must strive to ensure that an appropriate level of common oversight, understanding and approaches are in operation to help drive and prioritise our activities, especially as we approach the implementation of new tools, methodologies and strategies into national systems. This requires liaison with national programmes and systems and a strong stakeholdership by developing countries in research activities.

Robert G Ridley is Director of the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (WHO/TDR). Prior to this, he held the positions of Coordinator, Product Research and Development, WHO/TDR, Chief Scientific Officer and acting Chief Executive Officer for the Medicines for Malaria Venture and Vice Director in the Infectious Diseases Drug Discovery Department in F Hoffmann-La-Roche Ltd. in Basel. With a background that covers the fields of organic chemistry, biochemistry and molecular biology, he has also held positions at the University of Malawi, McMaster University, Canada and Edinburgh University, UK.

References

Babiker, M. et al. 2004. 'Artesunate combinations for treatment of malaria: meta-analysi's. Lancet 363, 9-17.

Global Forum for Health Research. 2002. The 10/90 Report on Health Research 2001-2002. Global Forum for Health Research, Geneva.

IPTi Consortium, 2004, Intermittent Preventive Treatment in Infants (IPTi). http://www.cdc.gov/malaria/cdcactivities/ipt i.htm

Remme, JHF, et al. 2002. 'Strategic emphases for tropical diseases research: a TDR perspective'. Trends in Parasitology 18 (10): 421-426.

Remme, J.H.F. 2004. 'Research for control: the onchocerciasis experience. 'Tropical Medicine and International Health' 9, 243-254.

Sundar, S. et al. 2002. 'Oral miltefosine for Indian visceral leishmaniasis'.

New Engl. J. Med. 347, 1739-1746.

World Bank, 2004. The Millennium Development Goals for Health. Rising to the Challenges. World Bank, Washington DC.

World Health Organization, 2003. Scaling up Home Management of Malaria: From Research to Implementation. World Health Organization,

World Health Organisation, 2004a. World Health Report 2004. Changing history. World Health Organisation, Geneva 2004.

World Health Organisation, 2004b. Intensified Control of Neglected Diseases. Report of an International Workshop, Berlin December 10-12, 2003. World Health Organisation, Geneva.



An AIDS vaccine: the role of public policy

A vaccine to prevent HIV infection and AIDS is urgently needed—no viral epidemic has ever been controlled without a vaccine. More than 20 years since HIV was identified, important progress has been made, although significant challenges remain. Concerted action by the public sector is critical to accelerating the development of a vaccine and assuring global access to it.

Increasing investment in vaccine R&D

An AIDS vaccine is one of our era's most challenging scientific quests. Global spending on AIDS vaccine research and development (R&D) has grown fivefold over the past decade, to an estimated US\$650 million annually today. However, this represents less than 1% of all global spending on new health products. Substantially increased investment, strategically targeted and well coordinated, would allow scientists to overcome the barriers to developing a vaccine.

Creating incentives for the private sector:

Expertise to develop new health products is concentrated in biotechnology and pharmaceutical companies. Yet the private sector accounts for just 15% of total investment in an AIDS vaccine. This reflects the high risks and relatively low returns that companies see for a vaccine needed most in the developing countries that are least able to pay. Bold and imaginative public policies could spur greater private investment, through measures such as direct subsidies, tax credits, intellectual property benefits and advance purchase guarantees.

Preparing for clinical trials in developing countries: Candidate vaccines must be tested in developing countries, where more than 95% of new HIV infections occur and different subtypes of the virus are circulating. Improved R&D and health care infrastructure is needed, as is strong leadership to engage trial communities. Public sector-led efforts have begun in Africa, Asia and Latin America, and should be stepped up.

Planning for access

The world must begin planning now for the rapid and widespread delivery and uptake of an AIDS vaccine. This will help avoid the decades' delays in access that have occurred with other vaccines. This planning can also motivate industry.

Assessing potential demand: It is vital to obtain reliable estimates of how many people would be willing to receive and pay for an AIDS vaccine.

Preparing to produce sufficient supply:

Manufacturing is one of the most complex and costly components of vaccine development. Engineering a production process and building a large-scale facility cost hundreds of millions of dollars and can take more than six years. If ample supply is to be ready soon after a product license is awarded, public sector work on manufacturing must begin well in advance.

Expediting regulatory review: Government systems for regulating life-saving health products are not structured to facilitate rapid access. For example, much can be done to simplify review processes; currently global licensure would be delayed by developers having to submit different applications in different countries. In addition, much can be done to strengthen regulatory capacity in Africa, Asia and other regions where a vaccine will need to be reviewed expeditiously.

Pricing and financing: Billions of dollars are likely to be needed to purchase a vaccine for lowand middle-income countries, even if the price is tiered by ability to pay. Creative financing mechanisms will have to be developed and supported by multilateral institutions and donors.

Distributing a vaccine: Unlike current vaccination programs, which target infants and young children, an AIDS vaccine will be initially geared toward adults and adolescents. Public health officials must design and implement innovative systems for reaching these groups.

Working together to end AIDS

Accelerating the development of a vaccine and assuring access must be a priority within a comprehensive response to the epidemic. IAVI is committed to working closely with the public and private sectors in both industrialized and developing countries, to identify policies that mobilize the necessary human, technical and financial resources. Together we can end AIDS.

Dr. Robert Hecht of IAVI will present at the Ministerial Summit on Health Research, II am Thursday, New health technologies from public-private partnerships to achieve the Millennium Development Goals.

Dr. Holly Wong will present at the Global Forum/ IPPPH Satellite Workshop, 9 am to 3 pm Tuesday.

Dr. Chutima Suraratdecha will present at the Global Forum parallel session 6, 4:15 pm Thursday.

IAVI is a global not-for-profit organization whose mission is to ensure the development of an AIDS vaccine that is accessible to all.





Fighting AIDS, TB and malaria – the research imperative



Article by Richard G A Feachem

here is plenty of good news in global health. The world as whole, and all regions of the world, became much healthier in the decades following the Second World War. This was true in rich countries and in poor countries, and among rich people and poor people. Life expectancy at birth, the principle single measure of the health status of a population, increased more in the four decades from 1950 than during previous recorded human history.

Around the world today, these positive trends continue in many populations and for most diseases. There are, however, five big exceptions; global health challenges that are worsening steadily and, in some cases, worsening rapidly. Two of these are non-infectious and have been the subject of considerable international debate and action in recent years. The first is the rising epidemic of tobacco abuse and its negative health consequences. The second is the global epidemic of obesity, and the many diseases that result from this. In addition, there are three major infectious diseases which have worsened steadily over the last two decades and which together provide a major challenge for social and economic progress around the world. These are AIDS, TB and malaria.

It was the recognition, around the turn of the century, that business-as-usual was not making a difference, and that AIDS, TB and malaria were continuing to expand and increase, that led to the creation, in 2002, of The Global Fund to Fight AIDS, TB and Malaria.

The Global Fund is not a research financing organisation and was not created with a mandate to support research. Its work, however, is dependent upon research of two main kinds, as described below.

Research into new products and technologies

The fight against AIDS, TB and malaria is dependent on many inputs. Among these are drugs, diagnostics and vaccines. Starting with drugs, the world urgently needs drugs against the three diseases which are low-cost, easy to administer, safe, and effective. The picture today is not good. For HIV/AIDS, the current drugs prolong life but do not cure. Although prices have fallen dramatically in the past three years, they remain expensive. They have substantial side effects for many patients and need to be taken for the remainder of a person's life. For tuberculosis, the main

problem is that the drugs, while effective, have to be taken for six months or more in order to affect a cure. In addition, resistance of the bacillus to a range of the more commonly used drugs is rising rapidly, creating the phenomenon of multi-drug resistant tuberculosis. This is both very expensive and very difficult to treat. For malaria, widespread resistance to the first and second generation anti-malarial drugs is now forcing country after country to switch to the more expensive, but highly effective, artemisinin-combination therapies (ACTs). These products are not ideal; they have a relatively short shelf-life, their safety for pregnant women is not certain, and the production process involves cultivation of plant material in China.

In the field of diagnostics, for all three diseases, considerable progress has been made in the last few years. For example, HIV diagnosis is now possible based on saliva or urine samples. Notwithstanding this progress, there is still a need for cheaper, simpler and more accurate diagnostic

Coming to the subject of vaccines, the needs are urgent and enormous. We have no effective vaccine against AIDS, TB or malaria. To have any one of these, let alone all three. would represent a huge breakthrough for the world. Indeed, an effective HIV vaccine is undoubtedly the holy grail of international public health.

In addition to drugs, diagnostics and vaccines, there are a variety of other products and technologies which are needed and sought after to help the fight against the three great infectious pandemics. For example, microbicides would provide a female-controlled method of limiting the transmission of HIV during sexual intercourse.

Largely as a result of the leadership and financing provided by the Bill & Melinda Gates Foundation, the priority attached to these research tasks is higher today than it was in the late 1990s. Significant investments are now being made in the necessary research, both in private sector and public sector laboratories. This is also a new and very heartening focus on products that can be immediately applicable and widely used in the developing world. For too long we have seen a 20 year gap between the emergence of a new product and its widespread use in low-income countries. Many of the new research initiatives are specifically dedicated to launching products first in the developing world or, at least, simultaneously in the developing and developed worlds.

The Global Fund was not created to invest in research of this kind. It can, however, provide a significant incentive for the conduct of research. Specifically, the Global Fund represents substantial purchasing power for new drugs, diagnostics and vaccines as they become available. This purchasing power operates on behalf of countries and communities that are too poor to purchase these products using their own resources. This provides a substantial 'pull factor' in the market dynamic and provides an incentive for further investments in research and development to bring new products to the market place.

The sums of money involved are substantial. The Global Fund's current portfolio includes 300 programmes in 130 countries. The five year value of these programs is \$8 billion. Roughly half of this money is to be spent on commodities directly relevant to AIDS; TB and malaria and perhaps a third of it will be spent on drugs specifically. These sums of money are large enough to influence the global market place and, in particular, to provide an incentive for the private sector for research and development investment into new technologies. It is too soon to quantify the degree to which this incentive is operating. Anecdotally, positive signs are apparent, particularly in the field of third-generation malaria drugs.

Operational research

An equally important and substantially neglected field of research is operational research. I use this term very broadly to include any kind of research or systematic collection of information and evidence which assists the management and implementation of more effective programmes. The key to operational research is 'learning while doing'.

In the field of AIDS, TB and malaria, we are witnessing the beginnings of a massive scale-up of prevention activity and access to treatment. These scale-up programmes are ambitious and, in many cases, take us into new and uncharted territory. The extreme example of this is the 'Three By Five' campaign to bring access to antiretroviral therapy to three million people by the end of the year 2005. The world has never taken on a more challenging task in the field of international health. It is imperative that as these major programmes roll out, country by country, we put in place the mechanisms to measure, to study, to learn lessons, and to share those lessons widely. Today, none of this is in place.

Taking the particular example of HIV/AIDS, the three major funders of the expansion of prevention and treatment programmes are the President's Emergency Plan for AIDS Relief (PEPFAR), the World Bank Multi-Country AIDS Program (MAP), and the Global Fund. None of these financing mechanisms have arrangements in place to ensure that the necessary operational research gets done, that it gets done at a high international standard, and that its results are widely disseminated. Let me take the example of the Global Fund to illustrate this point.

The Global Fund encourages its applicants to build operational research into their programmes and to include budget lines to fully support this research. We are ready and willing to make substantial investments in this arena. Some applicants take this advice and some applicants do not. For

The Global Fund encourages its applicants to build operational research into their programmes and to include budget lines to fully support this research. We are ready and willing to make substantial investments in this arena

those who do, there is at the present time little prospect that this money will be well spent or will lead to robust and generalisable conclusions. There is nothing new to this experience.

When I joined the World Bank in 1995 to become the Director of Health, Nutrition and Population, I commissioned a review of World Bank commitments to operational research within the health, nutrition and population portfolio. I discovered that the Bank was committing something in the order of \$80–100 million per year for these purposes, not large in relation to the overall cost of the programmes, but huge in relation to the standards of research funding. I then inquired what results and products were arising out of these very substantial investments. The answer was 'practically nothing'. Typically, the monies for operational research were either unspent and returned to the Bank at the end of the loan period or they were spent in a way that produced little or no tangible results.

The reasons for this are clear. In programmes that focus on implementation, the needs for operational research and for the proper spending of the operational research budget allocation will never feature highly in the priorities of the programme managers, either in the recipient organisation or in the funding agency. In addition, the individuals in the funding agency and the recipient organisation who are responsible for achieving the goals of the programmes will typically not be researchers, not have well-honed judgments in the field of research, and not be well connected with the research community. Therefore, researchers from local research institutes are not involved in the task of designing and conducting the studies and international support in research design and analysis is not mobilised.

The opportunities for operational research in AIDS, TB and malaria are large and varied. They range on a spectrum between the simple systematic collection of data to allow programme managers to make improvements during the life of the programmes, right through to ambitious randomised controlled trials.

It sometimes surprises people to learn that randomised control trials, the gold standard for all public health research, are possible within the context of the implementation of national programmes. In certain circumstances, they are. Two very good illustrations of this are the implementation of nationwide hepatitis B vaccination in The Gambia and the implementation of the 'Progressa' income transfer scheme in Mexico. In both cases, researchers and the relevant government officials sat down prior to the launch of these ambitious national programmes and concluded that the roll-out could be randomised in a way that was ethical and that would not disadvantage citizens in comparison with an unrandomised roll-out. The essential feature of all roll-outs is

that not everybody gets the service next Monday morning. Some will get it soon and some will have to wait, and this is an inevitable consequence of the practical challenges of going from zero service to one hundred per cent coverage.

With this in mind, one speculates that across the 130 countries where the Global Fund is now investing, there may be four (or maybe eight or maybe twelve) where conditions exist to randomise the roll-out. This might be the roll-out of long lasting pre-impregnated nets, it might be the roll out of a particular approach to HIV education for secondary school children, or it might be the roll-out of antiretroviral therapy. In any case, if the roll-out is randomised it provides a unique opportunity for robust conclusions concerning impact, and these conclusions can greatly and positively effect future investments. If the conclusions are extremely positive, one has the best possible argument for replication of the model and for substantial additional investment. If the conclusions are negative, one is learning something early, which otherwise might not be learnt at all, and using this information to either redesign the programs or to move the investments to other more productive areas.

Conclusions

In conclusion, the need for substantially increased research

both in product development and operations is evident. The Global Fund can never be a leader in either of these arenas. In product development, it is my hope and intention that we can provide a substantial financial incentive for larger investments in research and development to bring much needed new products to the market place. In operational research, we can be a major financer (in TB and malaria, the major financer) of expanded operational research capacity and activity across the developing world. However, this desirable outcome will not occur unless other organisations, whose mandate is research and who are expert in this arena, come together, seize the opportunity, and ensure that Global Fund investments in operational research are put to good use .

Richard Feachem, CBE is the Executive Director of The Global Fund to Fight AIDS, Tuberculosis and Malaria. Prior to this, he was Professor of International Health at the University of California, San Francisco and Berkeley. Professor Feachem has worked in international health and development for 30 years and has published extensively on public health and health policy. In 1995, he was awarded a CBE for services to international health by Her Majesty Queen Elizabeth II.



Damaris Wanjiku Murigi (type 2 diabetes), Kenya.

/ Wish ...

...that more was done to educate people about diabetes.

Novo Nordisk is a focused healthcare company and a world leader in diabetes care. We believe that significant improvements in diabetes care will occur not only through better medical treatment but also through greater awareness of diabetes. We are therefore taking an integrated approach to diabetes care.

We work actively to promote collaboration between all parties in the healthcare system to improve the quality of care of diabetes. Through concerted global action we promote a new approach to diabetes care that places the person with the condition at the centre of care.

We join forces with all parties to reach our common objective: To defeat diabetes.



Chronic diseases: research and policy priorities



Article by Robert Beaglehole

hronic, non-communicable diseases such as heart disease, stroke, cancer and diabetes, despite being the leading global causes of death and disability, are notably absent from international development discussions and actions. This paper makes four points. First it reaffirms the critical importance of chronic, non-communicable diseases as causes of ill health globally - and especially in low and middle income countries - and their potential, and under-appreciated, constraint on economic and social development in all countries. Secondly, it emphasises the unrealised potential for the prevention and control of all major chronic diseases. Thirdly, it considers the absence of chronic diseases from the Millennium Development Goals and how best to align the chronic disease agenda with the MDG agenda. Fourthly, it highlights the importance of operational research for the prevention and control of chronic diseases, rather than more epidemiological, clinical or laboratory research

The burden of chronic diseases

Since the early decades of the last century, chronic, non-communicable diseases (principally heart disease, stroke and cancer) have been the leading causes of death and disease in most wealthy countries. Only recently has it been appreciated that these diseases are now the leading cause of death in all regions of the world, except Africa.

Of the 45 million deaths among adults aged 15 years and over in 2002, 32 million, or almost three-quarters, were caused by chronic diseases which killed almost four times as many people as communicable diseases and maternal, perinatal and nutritional conditions combined (8.2 million, or 18% of all causes). Injuries killed a further 4.5 million adults in 2002, one in ten of the total adult deaths. The burden of chronic diseases (as measured by Disability Adjusted Life Years) is increasing, accounting in 2002 for nearly half of the global burden of disease (all ages), a 10% increase from estimated levels in 1990.

While the proportion of burden from chronic diseases in adults in developed countries remains stable at over 80%, the proportion in middle-income countries has already exceeded 70%. Surprisingly, almost 50% of the adult disease burden in the high-mortality regions of the world is now attributable to chronic diseases (*World Health Report, 2003*). Population

ageing and changes in the population distribution of risk factors, in response to local and global forces, have accelerated the epidemic of chronic diseases in many low and middle income countries (Beaglehole and Yach, 2003).

Cardiovascular diseases account for approximately 17 million deaths in 2002 and for 13% of the disease burden among adults over 15 years of age. Ischaemic heart disease and cerebrovascular disease (stroke) are the two leading causes of mortality and disease burden among adults over age 60. 7.1 million cancer deaths are estimated to have occurred in 2002. Lung cancer is the most readily preventable cancer with an estimated 1.2 million deaths, an increase of nearly 30% since 1990, reflecting the emergence of the tobacco epidemic in low-income and middle-income countries.

Although we are most comfortable with epidemiological expressions of the burden of chronic diseases, from a policy perspective the social and economic burdens are at least of equal importance. Unfortunately, and in contrast to considerable work on the impacts of infectious diseases – for example, by the Commission on Macroeconomics and Health (Commission on Macroeconomics and Health, 2001) – there have been no systematic studies of these impacts of chronic diseases. The forthcoming Macroeconomics and Health Report for Central and Eastern Europe will begin to fill this gap and provide a model for other countries and regions.

The impact of chronic diseases on social institutions will. fortunately, never be as acute as HIV/AIDS; it will be less visible, but in the long term they will have enormous adverse effects on societies. There is considerable evidence from wealthy countries on the costs of specific chronic conditions. e.g. diabetes (International Diabetes Federation, World Diabetes Foundation, 2003), cardiovascular diseases (American Heart Association, 2003) and, increasingly, obesity (Finkelstein et al, 2004) has received much attention. Recent, albeit limited, data from five low and middle income countries highlights the impact of cardiovascular disease on the middle aged workforce, just as was apparent in wealthy countries when these epidemics were at their peak in the middle decades of last century; this report also stresses the equal importance of cardiovascular disease to women and men (Leeder et al, 2004).

The causes of chronic diseases are known and they are preventable

An impressive body of research has identified the causes of the chronic disease epidemics, with the exception of breast and prostate cancers. The major risk factors for chronic diseases are indicators of future health status, and five of the top 10 risks worldwide are specific to chronic diseases (World Health Report 2002). These major chronic disease risk factors - tobacco use, inappropriate diet and physical inactivity (primarily expressed through unfavourable lipid concentrations, high body-mass index, and raised blood pressure) explain at least 75-85% of new cases of coronary heart disease (Magnus and Beaglehole, 2001). In the absence of elevations of these risk factors, coronary heart disease is a rare cause of death. Unfortunately, the vast majority of the populations in almost all countries are at risk of developing chronic diseases because of higher than optimal levels of the main risk factors. Only about 5% of adult men and women in wealthy countries are at low risk with optimal risk factor levels. There are only a few very poor countries in which these factors have not yet emerged as major public health problems.

It is not surprising, given the extensive knowledge on the causes of chronic diseases, that they are on the whole preventable. Application of this knowledge has had a major beneficial impact on chronic disease death rates in many wealthy countries, especially for cardiovascular disease and to a lesser extent lung cancer in men (Hunink et al., 1997). These declines account for the rapid increases in life expectancies in adults in many wealthy countries, even though much of this benefit has accrued to the more advantaged segments of these populations.

Chronic diseases and the MDGs

The absence of chronic diseases from the MDGs is notable. given their domination of the global mortality and burden of disease patterns in all regions except Africa, and their contribution to health inequalities. The origin of the MDGs in the international development discourse in the 1990s helps explain this absence. The United Nations conferences in the 1990s focused on a narrow range of health concerns around maternal and child health issues and infectious diseases, and came up with a set of targets which concentrated attention on these issues. There is a need to both develop acceptable chronic disease prevention and control targets and at the same time work towards broadening the health development agenda in line with the complexities of the health situation in all countries. It would not be surprising if the absence of chronic diseases from the MDGs reduces - at first sight - the relevance of the MDGs to many countries in transition in Eastern Europe and even to low mortality developing countries such as China.

There are several reasons to attempt to align the chronic disease agenda with the MDGs. First, the MDGs represent a compact between rich and poor countries and this key concept of partnership can be used to further the chronic disease prevention and control agenda, especially given the emerging evidence on the economic implications of chronic

diseases which are probably of equal importance to other causes of ill health in perpetuating poverty. Secondly, there is a real danger that an overriding commitment to the MDG agenda will distort resource allocations for countries, donors and WHO, away from the social and economic reality. Hence the need for chronic disease advocates to be involved in MDG discussions to ensure a balanced approach to health development and to move away from a narrow, literal interpretation of the MDGs. As poor countries build their health systems to provide prevention and control services to achieve key MDG goals, these same services could readily be used for chronic disease prevention and control programmes. Finally, monitoring of MDG 6 will in future include trends in health adjusted life expectancy (HALE). Since chronic diseases are major contributors to HALE, their relevance to the MDGs is reinforced.

The reasons for the neglect of chronic diseases - generally and specifically from the MDGs - by international development agencies are complex. In all countries there is the inevitable priority given by health systems to acute infections, especially those like SARS which can have major and rapid adverse economic impacts. There is a misconception that chronic diseases are still the preserve of men in wealthy countries, despite the enormous amount of evidence to the contrary. The notion that these conditions are caused by lifestyles totally under the control of individuals not only persists in most countries but in some is the dominant paradigm for health, despite the overwhelming importance of the social, economic and cultural environment in determining human behaviours. Since the major determinants of chronic diseases are not under the direct control of individuals, the case for government leadership in the chronic disease agenda is strong, just as it is for the MDGs more generally.

Research priorities for chronic diseases

Essentially, the causes of chronic diseases are known and there is little need for research to identify new and unknown causes. However, further research is required to explore the many variations in the occurrence of chronic diseases, both within and especially among countries (Beaglehole and Magnus, 2002). Of particular interest is life course research examining influences that accumulate over a lifetime, and complementary attempts to explain socioeconomic inequalities in risk, between both individuals and regions.

A critical research issue is the need for a comprehensive analysis of the non-health effects of chronic diseases. Cost of illness studies are only a start. More important is an assessment of the direct and indirect economic effects of chronic diseases on societies, communities and families and on already stretched health services. These impacts will only increase as societies age.

A major priority for new research is on prevention policy and programme effectiveness and on issues of importance for the spread of the chronic disease epidemics to poor populations. Policy directed research will have the biggest public health pay off in the short term, as it has had for tobacco control. There is an urgent need for epidemiologists and other public health scientists to explore the applicability

of new research methods to the underlying social, economic and cultural determinants of chronic diseases. Some of the required research is more a matter of academic interest; some may in time provide extra leads to effective public health action. However, the unresolved issues should not detract from the urgency of applying what we know, especially in low- and middle-income countries which will bear the brunt of the global chronic disease epidemics.

Policy issues

The main issue for policy-makers, at all levels of public health in low and middle income countries, is how to deal with the growing burden of chronic disease epidemics in the presence of persisting communicable disease epidemics. Furthermore, this challenge must be faced even where health system resources are already inadequate. Although considerable policy gains can be made very cheaply, especially intersectorally, extra resources must be found, just as for infectious disease prevention and control. This requires a greater share of national resources for health care, better use of existing resources, and new sources of funding. A special tax on tobacco products for disease prevention and control programmes is a readily available source of new funds and experience with these forms of funding is growing.

Another critical policy issue concerns the appropriate balance between primary and secondary prevention and between the population and high-risk approaches to primary prevention. If the goal is to increase the proportion of the population at low risk and to ensure that all groups benefit, the strategy with the greatest potential is the one directed at the whole population, not just people with high levels of risk

If the goal is to increase the proportion of the population at low risk and to ensure that all groups benefit, the strategy with the greatest potential is the one directed at the whole population, not just people with high levels of risk factors or established disease

factors or established disease (Rose, 1985). All other strategies will, at best, only blunt the epidemics and likely increase inequalities; they will not prevent the epidemics. The ultimate public health policy goal is the reduction of population risk, and since most of the population in most countries is not at the optimal risk level, it follows that the majority of prevention and control resources should be directed towards this goal in the entire population. Evidence is available in support of the cost-effective policies required for the task of making the small – but powerful and surprisingly rapid – shifts in risk distributions in entire populations in a favourable direction. Similarly, management decisions based on measures of overall risk are more cost-effective than those based on single risk factors.

Untold lives lost are lost unnecessarily because of inadequate acute and long-term management of chronic diseases. Relatively cheap interventions for chronic diseases are available (Yusuf, 2002), and single combination pills including aspirin and drugs for blood pressure and cholesterol

lowering for possible use in chronic care are under development (Wald and Law, 2003). Even in wealthy countries, however, the potential of these and other interventions for secondary prevention is far from fully utilised. The situation in poorer countries is even less satisfactory. There are many opportunities for coordinated chronic disease risk reduction, care and long-term management. Smoking cessation and the identification and management of diabetes, for example, are just two priorities. Cost-effective interventions, such as the use of aspirin in people with myocardial infarction, would prevent a quarter of the deaths associated with heart attacks and are usually much more cost-effective than more radical interventions.

A coherent policy framework, encompassing legislation, regulation and mass education is critical for chronic disease prevention and control, since individual behaviour change is difficult in the absence of conducive environmental alterations. A suggested stepwise framework for a comprehensive response to chronic disease prevention and control is under development and can be modified according to national needs, goals and targets (*World Health Report 2003*).

Unfortunately, the global and national capacity to respond to chronic disease epidemics is woefully inadequate. Few countries have implemented comprehensive prevention and control policies and development of capacity, especially for policy and programme development and implementation research, has not kept pace with the epidemiological transition. The gaps between the needs for chronic disease prevention and control and the capacity to meet them will grow even wider unless urgent steps are taken.

WHO and governments cannot confront the challenges of chronic disease prevention and control alone. As with tobacco control, partnerships and interactions with international consumer groups and global commercial multinationals are essential. WHO has developed the Global Strategy on Diet, Physical Activity and Health as a strategic framework within which WHO and Member States can work together across sectors in preventing chronic diseases. This population-wide prevention strategy is based on extensive consultations with stakeholders: Member States, the United Nations and intergovernmental organisations, civil society and the private sector.

Globally, there is still only limited advocacy for the prevention and control agenda and what there is tends to be fragmented. The lack of unified advocacy for health promotion compares poorly with the growing dominance of commercial and consumer groups who have placed treatment at the centre of health policy debates and funding priorities. Broader alliances of major health professional bodies, consumer groups and others are needed to promote the prevention of major risk factors for chronic diseases and to track progress to agreed national and global goals – perhaps modeled on the MDGs. Since the determinants of chronic diseases are multisectoral, advocacy and action, too, must extend well beyond the health sector. The involvement of non-governmental organisations in articulating the demand for speedy implementation of policies and programmes

relevant to chronic disease control is critical for catalysing policy change and for mobilising communities to ensure that the benefits flow to the entire population.

While the pace of globalisation of the major risks for chronic diseases is increasing, progress towards prevention and control is slow. Sustained progress will occur only when governments, international agencies, nongovernmental organizations and civil society acknowledge that the scope of public health activities must be rapidly broadened to include chronic diseases and their risk factors. Chronic disease prevention and control advocates should use the MDG framework and experience as a model for their own efforts which should be synergistic with, and not in competition with, the infectious disease agenda.

Finally, it is probably true that most of the facts in this paper are known to many policy makers and politicians. Yet action is limited. There is a serious need for research into the

most effective levers for policy change around the chronic disease agenda. With this knowledge we could identify the best advocacy approaches and the best entry points and partners for the multisectoral actions that are required. Will childhood obesity, for example, provide the spur for action? It is often said that these conditions began to be taken seriously in wealthy countries as a response to their direct impact on politicians. Will we have to wait for a generation of middleaged politicians in middle-income countries to be struck down by heart attacks and strokes before these issues are taken seriously? The fact that WHO is now taking chronic disease more seriously provides hope that we may be able to shortcut this process.

Robert Beaglehole, a New Zealand public health physician, is Director of the Department of Chronic Diseases and Health Promotion at WHO, Geneva.

References

American Heart Association. 2003. Heart Disease and Stroke Statistics – 2004 Update. Dallas, Texas: American Heart Association.

Beaglehole R, Magnus P. 2002. 'The search for new risk factors for coronary heart diseases: occupational therapy for epidemiologists?' *International Journal of Epidemiology* 31: 1117-1122

Beaglehole R, Yach D. 2003. 'Globalisation and the prevention and control of non-communicable disease: the neglected chronic diseases of adults.' *The Lancet* 362: 903-908.

Commission on Macroeconomics and Health. 2001. Macroeconomics and health: Investing in health for economic development. Report of the Commission. Geneva: World Health Organization.

Finkelstein E.A, Fiebelkorn I.C, Wang G. 2004. 'State-Level Estimates of Annual Medical Expenditures Attributable to Obesity'. *Obesity Research* 12: 18-24.

Hunink MG, Goldman L, Tosteson ANA, et al. 1997. 'The recent decline in mortality from coronary heart disease, 1980-1990'. *Journal of the American Medical Association* 277: 535-542.

International Diabetes Federation, World Diabetes Foundation. 2003.

Diabetes Atlas Second Edition. Chapter 4: The Economic Impact of Diabetes.

Leeder S, Raymond S, Greenberg H, et al. 2004. *Race Against Time: the challenge of cardiovascular diseases in developing economies*. New York: Columbia University.

Magnus P, Beaglehole R. 2001. 'The real contribution of the major risk factors to the coronary epidemics: time to end the 'only 50%' claim'. Annals of International Medicine 161: 2657-60.

Rose G. 1985. 'Sick individuals and sick populations'. *International Journal of Epidemiology* 14: 32-38

Wald NJ, Law MR. 2003. 'A strategy to reduce cardiovascular disease by more than 80%'. *British Medical Journal* 326: 1419-1424.

World Health Report 2002: Reducing risks, promoting healthy life. Geneva: World Health Organization.

World Health Report 2003: shaping the future. Geneva. World Health Organization.

Yusuf S. 2002. 'Two decades of progress in preventing vascular disease'. The Lancet 360: 2-3.

Health research to address selected chronic disease risks

Article by Derek Yach

hronic diseases include a heterogeneous group of conditions that usually emerge in middle age after a long exposure to unhealthy consumption patterns. This article will focus on cardiovascular diseases (mainly coronary heart disease and stroke), common cancers, chronic respiratory diseases (mainly COPD and asthma) and diabetes. Emphasis will be given to three major unhealthy consumption patterns - tobacco use, unhealthy diets and physical inactivity. Research needs are identified in relation to health impacts and economic implications, and the effectiveness of interventions, and are summarised in Table 1.

Research output on chronic diseases and risks from developing countries

There is a paucity of research conducted on chronic diseases by researchers in developing countries (see Figure 1). Authors from the United States and United Kingdom dominated research output in all disease/risk categories, accounting for 80% of research on tobacco and cancer, 75% on diabetes and cardiovascular disease and 60% on obesity. India and China produced less than 3.5% in all categories, despite being home to 40% of the world's population and a large share of the chronic disease burden. This neglect of research in developing countries mirrors a deeper neglect of chronic diseases and their risks by governments of most of those countries and by the international donor and development community (Yach et al., 2004; Alwan et al., 2001).

Disease mortality and burden

Worldwide, approximately 56 million deaths occurred in 2003, of which chronic diseases in adults accounted for 60 percent (WHO, 2002). Cardiovascular disease (CVD), especially coronary heart disease (CHD) and stroke, caused 16.7 million deaths; cancer, 7 million deaths; chronic

Research needs	Current efforts	Future players, institution
Comprehensive health promotion research programmes (include issues related to capacity, institutional support, implementation, financing)	None at global level	FIC/NIH; Wellcome; WHO; World Bank; academic networks
 Descriptive epidemiology and surveillance on deaths, diseases, risks; causal studies on diets, physical activity and marketing; co-morbidity; inequalities 	Several national efforts; CDC/GYTS; FIC/NIH support for global tobacco control research; IC-Health; IDRC (for tobacco)	Above and CDC
3. Economic impact of risks and diseases; transnational economic impacts of changes in worker productivity	World Bank; several investment companies; Earth Institute	World Bank; IMF; EC
4. Policy research • personal behaviour and government roles • economic and fiscal policies to effect consumption • new business models to incentivise health gains • effective regulatory approaches (including multistakeholder approaches (to marketing to children) • intersectoral research: urban design for activity and healthy eating; agriculture for health	No significant support; some work within businesses; World Bank	
5. Demonstration research projects • obesity • multiple risks in workplace and school settings • 'healthy cohorts'	Oxford Vision 2020 (planned)	FIC/NIH; academic- business-government consortia
Health services research missed opportunities for prevention tobacco cessation and secondary prevention of CVD, stroke	George Institute; IC-Health	FIC/NIH; Wellcome; WHO

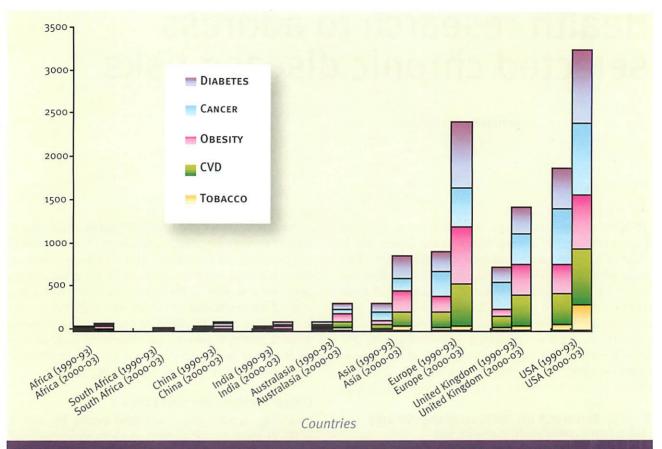


Figure 1: Number of authors from regions and countries publishing or co-publishing papers on chronic disease or their major risk factors in 1990/93 and 2000/03

respiratory disease, 5.2 million deaths; and diabetes, almost a million deaths. Three key risk factors - tobacco, the dietphysical activity related complex and alcohol - explain a significant proportion of the burden of chronic diseases. 72% of deaths from chronic diseases occur in low and lower middle income countries (WHO, 2003) and, relative to higher income nations, are more likely to occur amongst younger people (Leeder et al., 2004). In absolute numbers, twice as many deaths from CVD occur in developing countries as in developed countries. CVD accounts for 2.8 deaths a year in China and 2.5 million in India, dwarfing the combined totals of all deaths from infectious diseases in these countries (Beaglehole and Yach, 2003). Projected mortality for CHD and diabetes in developing countries is expected to increase sharply between 1990 and 2020. (Leeder et al., 2004; Wild et al., 2004).

Work on the burden of disease has provided useful estimates at the global and regional levels. However, basic mortality and key morbidity date is still lacking in many developing countries. National and sub-national estimates are needed on a regular basis.

Major risk factors

In high-mortality developing countries, four chronic-disease risk factors - tobacco, high blood pressure, indoor air pollution and high cholesterol – are among the 10 leading risk factors contributing to the burden of disease (see Figure 2) (WHO, 2003). In contrast, in developed countries, seven chronic-disease risk factors - tobacco, high blood pressure, alcohol, increased cholesterol, increased body mass index, low fruit and vegetable intake, and physical inactivity - are among the 10 leading risk factors contributing to the overall burden of disease.

Trends in risk factors for chronic diseases in developing countries are negative. The number of cigarettes smoked has more than doubled since 1960 (Mackay and Eriksen, 2002). Age of uptake of smoking is shifting towards early teenage years and young people exhibit high usage of other tobacco products. A survey of one million 13-to-15-year-olds demonstrated that tobacco use occurs in one in five children in over 100 countries surveyed (Global Youth Tobacco Survey Collaborating Group, 2003). Obesity and overweight are becoming more prevalent among young people. Ten percent of the world's school-aged children are now estimated to be carrying excess body fat (Lobstein et al., 2004). Of these overweight children, a quarter are obese. Though the prevalence of overweight is higher in economically developed regions, it is rising significantly in most parts of the world.

Burden of risk estimates have not been calculated at the national level in most developing countries. Rapid expansion of WHO's STEPs approach to risk factor surveillance (Armstrong and Bonita, 2003), combined with a special focus on surveillance of key risk factors among children, building on the Global Youth Tobacco Survey (Global Youth Tobacco Survey Collaborating Group, 2003) is needed in all countries. The role of marketing and other key factors,

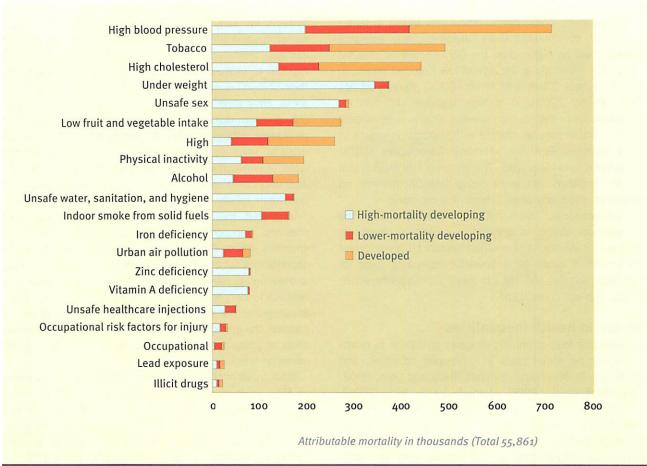


Figure 2: Mortality attributable to 20 leading risk factors, 2001

including changes in physical activity levels, in influencing the development of harmful childhood behaviours requires research. While the causal relationship between tobacco and ill health is beyond doubt, similar attention has not been given to the role of the complex mix of foods and physical activity in determining health outcomes. Cohort studies to evaluate the impact of these factors in diverse populations is needed.

Economic costs of selected chronic diseases and risks

Chronic diseases have a significant economic impact in developing countries by disabling and killing the working-age population (Leeder et al., 2004; International Diabetes Federation, 2003). This results in high direct costs (health care, treatment) and indirect costs (number of productive years lost, social security and pension costs). Popkin (2001) estimated that in 1995, diet-related chronic diseases accounted for 22.6% and 13.9% of healthcare costs (primarily state costs) in China and India respectively, while the estimated cost of lost productivity was 0.5% and 0.7% of GDP respectively. A systematic global effort is needed to develop standard methods for estimating economic impacts of chronic disease risks and outcomes, especially where data is imperfect and health service use inadequate.

Co-morbidity

There are important interactive impacts between certain

infectious and non-infectious diseases in developing countries. Several infectious agents cause cancer: hepatitis B virus causes liver cancer; human papillomavirus (HPV), cervical cancer; and HIV infection, several cancers (Stewart and Kleihaus, 2003).

Already there are vaccines in use and under development to prevent these infections. Continued investment in these areas is needed

Tobacco increases the death rate from TB - a classic disease of poverty - in those already infected. In India, smokers are 4.5 times more likely to die of TB than nonsmokers (Gajalakshmi et al., 2003). An estimated 80% of TB patients smoke. As a result, tobacco is probably the major cause of death in treated TB patients (Yach and Raviglione, 2004). Further, recent analyses of the determinants of chronic bronchitis based on a population survey in South Africa demonstrated how multiple assaults on the lung - including an infectious agent, TB, domestic biomass fuel use. occupational exposures and tobacco, are all important causes of chronic lung disease (Ehrlich et al., 2004). All are also related to poverty.

Co-morbidity and multiple risks are neglected by researchers and policy makers (see later).

Macroeconomic impacts

The effect of chronic diseases on national economies could have serious global impacts. This is because workers in emerging markets are not only generating growth in their home economies, but in developed nations. In fact, potential returns for developed country investors from emerging markets could be higher than the OECD countries over the long-term – especially in the light of low expected returns in mature markets (Clark and Hebb, 2004; Kimmis et al., 2002; Heller, 2003). If chronic diseases do diminish productivity as predicted, then investor returns in developing countries will in turn be affected with impacts on growth in OECD countries. Both Trans-National Corporations (TNCs) and pension funds face risks. The lesson of HIV/AIDS is that chronic conditions can place heavy financial burdens on companies, especially when treatment is expensive.

Macro-economic trans-national research on the consequences of chronic diseases in workers in developing countries for developed economies should be given urgent attention as it could be a powerful motivating force for developed countries and TNCs to invest seriously where their future profits will come from!

Impact on health inequalities

The risks that lead to chronic diseases contribute to health inequalities by social class in developed countries, and increasingly in developing countries (Batty and Leon, 2002; Mackenbach et al., 2000; Marmot, 1978; Yach, 2005). There is a need for researchers focusing on inequalities in health to identify which interventions and policies will have the most pronounced impact on reducing social class inequalities and engage in the development of health promotion approaches that explicitly target reduction in inequalities.

Determinants of chronic diseases and risks

The pace and impact of ageing in developing countries is only starting to be appreciated. Developing countries will soon be under the same pressures as developed countries to address the pensions consequences of ageing, albeit from a starting base of substantially less resources (Heller, 2003; Beaglehole and Yach, 2003).

Ageing need not be a risk factor per se for increased morbidity caused by chronic diseases. Evidence is emerging that in the United States for the last decade (Fries, 2003); mortality rates have dropped by 1% per year and disability rates by 2% a year, suggesting that compression of morbidity with longevity, as first postulated by Fries in 1980 (Fries, 1980), is possible. The decline in disability in people over the age of 65 has been dramatic and continues. The avoidance of health risks, such as smoking, lack of exercise, and obesity, have been shown as major factors in the postponement of disability.

Fries's work needs to be globalised through large-scale multi-country collaborative research projects. 'Healthy cohorts' would provide messages of hope at a time when ageing is still regarded more as a feared cost then as a triumph of health and development, and could lead to greater investment in health enhancement interventions at all ages, including for the elderly.

Urbanisation can stimulate chronic disease prevention

efforts by improving access to a wider variety of foods, health systems for early diagnosis and effective treatment and knowledge and information about healthy living. Urbanisation can also create conditions in which a mass of people are exposed to products like tobacco and unhealthy foods and their ubiquitous marketing – and a different working and social environment. (Yach, 1990; Popkin et al., 2001). Urbanisation distances people from the point of food production, with implications for dietary intake. When people move to urban areas, they adopt less physically demanding types of employment, such as manufacturing and services, and unplanned urban sprawl may not be conducive to pedestrian activity.

Integrated multi-disciplinary research involving town planners, transport experts and architects is needed in countries where the rapid pace of urban growth creates opportunities for city life to be designed to maximise health and welfare. Creative partnerships between city planners and research funders are needed to develop and test new ways of ensuring that the benefits of urbanisation accrue to all. In addition, the impact of rapid spread of supermarkets in urban areas of China and other developing countries for nutrition transition needs study.

Tobacco, alcohol and food products are increasingly traded by TNCs in developing economies. World Trade Organization (WTO) agreements since 1994 have significantly reduced tariff and non-tariff barriers to tobacco trade (Bettcher et al., 2003). This has resulted in greater tobacco trade between countries, leading to increased supply, more extensive marketing of all forms, lower prices and increased consumption.

Research is needed to understand the implications of changing trends of food trade for chronic diseases. A trend which may have implications for dietary patterns is the increased trade of high-value processed agricultural products (e.g. meats, dairy items, cakes and frozen foods). Exports of these products from the United States are growing faster than any other category of agricultural exports (Bolling et al., 1998).

Foreign direct investment (FDI) plays an unprecedented role as a source of funding and economic development in developing nations and has risen dramatically over the past 25 years – US\$162.1 billion flowed into developing countries in 2002, mainly from TNCs in developed countries (UNCTAD, 2003). FDI has important implications for chronic diseases because investment in tobacco, food and alcohol products is high. TNCs have specific incentives to invest in tobacco, food and alcohol because they favour investments in concentrated markets where there is high brand recognition of which cigarette, beer, soft drinks and confectionery products are prime examples. FDI may bring with it pressures for tax competition, creating disincentives for a tobacco tax in countries wishing to attract FDI; or pressures to avoid effective food labelling or controls on advertising to children.

Researchers need to consider how FDI could be more aligned with public health goals. This requires asking 'how can markets work for chronic disease prevention?' For example, could industry make core business investments that

are positive for health, encouraged by conditionalities placed on investment in risk-creating products? This would require careful research of the regulatory environment and financial systems in place in relation to new products and how they are marketed. Equity research suggests it is in the tobacco and food industry's interest to invest in healthier products (Swiss Reinsurance Company, 2004).

The flow of products around the world is accompanied by a flow of images designed to encourage their consumption. These images, such as brands, logos and promotional initiatives, influence behaviour through their emotional appeal and have the ability to shift cultural and social norms to a situation in which tobacco; alcohol and/or foods high in fats, sugars and salt are consumed regularly and frequently.

TNCs invest significantly in marketing, spreading brands all over the world while tailoring their campaigns to local conditions. Children are reached through adverts in the traditional media and on the internet, sponsorship of sports and music events, and through product placement. Marketing (along with other influences) promotes the use of tobacco (World Bank, 1999) and alcohol and influences dietary habits (Hastings et al., 2003) in children. However, developing countries have yet to strengthen their regulatory and educational capacities to address these concerns. (Hawkes, 2004a; Hawkes, 2004b).

The experience with tobacco led governments to recognise that voluntary agreements with industry do not work and that the optimal approach is a total ban. But that approach is not applicable to food (Yach et al., 2003). Rather, experts in marketing need to consider which combination of multistakeholder and intergovernmental codes will be effective to pursue in relation to restricting marketing of foods to young children.

Health promotion research

Health promotion requires a careful balance between individual, family and community responsibility; government regulations and policies; and multisectoral actions by government, industry and civil society. Research into health promotion therefore requires political scientists, ethicists, anthropologists and philosophers to provide intellectual guidance to public health researchers. There are often deeply held beliefs about the optimal role of governments in regulating private behaviour. Some of these beliefs are manipulated by commercial interests to avoid regulations and taxes; while others are based on concerns about public health paternalism and whether 'imposed' solutions to private behaviours are sustainable. In that respect, the democratisation of decision-making about the role of government at local and national level seems key. Experiences with the smoke free movement suggest that local initiatives may take longer to implement but are more likely to be supported. Research into optimal approaches to health promotion should straddle the interface between media. democracy and personal behaviour.

A key role for government is to embrace strategies that reduce exposure to risk factors and attempt to influence individual behaviour (Leeder et al., 2004). Governments can

influence the degree of risk exposure through population-based cross-sectoral interventions, fiscal policies and regulations on the information provided to consumers. Many have been incorporated into the Framework Convention on Tobacco Control (FCTC). Several provisions of the FCTC have implications for food policies (Yach et al., 2003). Researchers need to develop a way to evaluate such interventions individually and more importantly to determine what the best mix of interventions is to positively influence complex behaviours related to dietary behaviour.

Interventions for specific chronic disease prevention and health promotion concerns have been tried and tested. Systematic reviews, notably by the Cochrane Collaboration process, have evaluated the available evidence of effectiveness of these interventions (Riemsma et al., 2002). A global taskforce has identified priority areas for future Cochrane reviews, five of which refer to research on chronic disease risks (Doyle et al., 2004). These still require serious funding.

Many health promotion initiatives have been effective in low and middle income countries. Just three examples: blood pressure decline in China (Fu et al., 2003); effective tobacco control in Brazil, South Africa, Thailand, Poland, Bangladesh and Canada (de Beyer and Brigden., 2003); and increased in sporting activities in Singapore. But these examples are not wide-spread and generally research for community-based health promotion programmes are not supported in most developing countries. Exceptions include Brazil, South Africa and Thailand. In Thailand, a tobacco and alcohol tax funds the Thai Health Promotion Foundation which supports such research. Similar approaches are needed elsewhere (Guindon et al., 2002).

There is an urgent need to develop best practices for obesity control in all countries. There is no other major area of public health for which there are no best practises derived from large populations. To address the global obesity crisis requires serious investment in large-scale community based projects capable of providing evidence of effectiveness over a three to five year period.

Prevention in healthcare settings

In developing countries, the capacity of health systems to diagnose and treat chronic diseases is generally low. Essential medicines for chronic disease management are seldom readily available in primary care settings (Alwan et al., 2001). Even where chronic disease services exist, health care systems are not organised to provide effective and efficient prevention and care for chronic diseases. Opportunities for secondary prevention are also being missed (WHO-PREMISE study, 2004).

There is a need to develop standard approaches to measure missed opportunities for prevention of chronic diseases and their risks in developing countries and to require these to be reported regularly as a measure of health system performance.

Smoking cessation is generally undervalued as a key costeffective intervention that could save lives (Commission on Macroeconomics and Health, 2001). Demonstration research projects in developing countries using new drugs and vaccines need to be supported. Further, there is a need for research projects to test whether there is an interaction between smoke free public policies and the effectiveness of smoking cessation.

As mentioned earlier, there is also a major need for research to determine the effectiveness of smoking cessation among TB patients who smoke (Yach and Raviglione, 2004). Smoking cessation among patients with CHD is the single most effective intervention to reduce mortality in those patients. With a 36% reduction in the relative risk of mortality among CHD patients who quit, smoking is at least as important as other secondary prevention measures such as statins, aspirin and beta-blockers (Critchley and Capewell, 2003). Yet, this research is mainly carried out in developed countries.

Concluding comments

Over the last few decades there have been a few impressive examples of building sustained research and policy capacity to tackle a specific set of public health problems. One of the best documented is the Tropical Disease Research experience (Nchinda, 2002). Without serious financial and multiinstitutional support over decades, their successes would

have been limited. Now is the time to consider a major global research initiative to tackle the current and looming major neglected threats to the health of most countries. It should build on TDR and other examples of success; draw on fledgling and modestly supported efforts to increase research in diabetes, CVD, cancer, tobacco and related areas summarised in Table 1; work with enlightened commercial groups committed to finding where profits and public health coincide; and take a truly multi-disciplinary approach to research that would address the complex diversity of research questions that could ultimately lead to better health for all.

Acknowledgements

I thank Steve Glover and Nathalie Cohen for research support required to complete Figure 1.

Derek Yach is Professor of Public Health at Yale University. His former positions include Executive Director of Non-communicable Diseases and Director of the Tobacco Free Initiative, both at the World Health Organization; and Director of the Centre for Epidemiological Research at the Medical Research Council in South Africa.

References

Alwan A, Maclean D, Mandil A. (2001). 'Assessment of National Capacity for Noncommunicable Disease Prevention and Control'. Geneva, WHO.

Armstrong T, Bonita R. (2003) 'Capacity building for an integrated noncommunicable disease risk factor surveillance system in developing countrie'. Ethn Dis. Summer; 13(2 Suppl 2):S13-8.

Batty, G. D., & Leon, D.A. (2002). 'Socio-economic position and coronary heart disease risk factors in children and young people'. European Journal of Public Health; 12, 263-272.

Beaglehole, R, & Yach, D. (2003). 'Globalisation and the prevention and control of noncommunicable disease: the neglected chronic diseases of adults.' Lancet; 362, 903-908.

Bettcher D, Subramaniam C, Guidon E, Perucic A-M et al (2003). Confronting the Tobacco Epidemic in an Era of Trade Liberalization. Geneva, WHO.

Bolling C, Neff S, Handy C. (1998) U.S. 'Foreign Direct Investment in the Western Hemisphere Processed Food Industry'. Agricultural Economic Report No. 760. Washington DC, Economic Research Service, United States Department of Agriculture...

Clark GL, Hebb T. (2004). Understanding pension fund corporate engagement in a global arena. paper prepared for seminar 'Understanding Pension Fund Corporate Engagement in a Global Arena' (November 24th-26th, 2002), University of Oxford

Commission on Macroeconomics and Health, (2001). Macroeconomics and Health: Investing in Health for Economic Development, December 2001. World Health Organization, Geneva.

Critchley J, Capewell S. (2003). 'Mortality risk reduction associated with smoking cessation in patients with coronary heart diseases: a systematic review'. JAMA 290: 86-97.

de Beyer J, Waverley Brigden L. (2003). 'Tobacco Control Policy: Strategies, Successes and Setbacks'. World Bank/Research for International Tobacco Control, Washington D.C.

Doyle J, Waters E, Yach D et al. (2004). Global priority setting for Cochrane systematic reviews of health promotion and public health research. J Epidemiology and Comm Health, in press.

Ehrlich RI, White N, Norman R, Laubscher R, Steyn K, Lombard C, Bradshaw D.(2004) Predictors of chronic bronchitis in South African adults. Int J Tuberc Lung Disease; 8(3): 369-376.

Fries J F. (1980). 'Ageing, Natural Death, and the Compression of Morbidity'. The New England Journal of Medicine 303: 130-135

Fries J F. (2003) 'Measuring and Monitoring Success in Compressing Morbidity. Annals of Internal' Medicine 139: 455-459

Fu, D., Fu, H., McGowan, P., Shen, Y., Zhu, L. et al. (2003). 'Implementation and quantitative evaluation of chronic disease self-management programme in Shanghai, China: randomized controlled trial'. Bull World Health Organ, 81(3), 174-82.

References continued

Gajalakshmi V, Peto R, Kanaka TS, et al. (2003). 'Smoking and mortality from tuberculosis and other diseases in India'. *Lancet* 362:507-515.

Global Youth Tobacco Survey Collaborating Group (2003). 'Differences in worldwide tobacco use by gender: findings from the Global Youth Tobacco Survey'. *Journal of School Health*, 73, 207-215.

Guindon GE, Tobin S, Yach D. (2002) Trends and affordability of cigarette prices: ample room for tax increases and related health gains. Tobacco Control. March 1; 35-43.

Hastings G et al. (2003). Review of research on the effects of food promotion to children. Glasgow, University of Strathclyde, Centre for Social Marketing.

Hawkes C. (2004a). *Marketing Food to Children: The Global Regulatory Environment*. Geneva, World Health Organization.

Hawkes C. (2004b). *Nutrition Labels and Health Claims: The Global Regulatory Environment. Geneva*, World Health Organization.

Heller PS. (2003). Who Will Pay? Coping with Aging Societies, Climate Change, and Other Long-Term Fiscal Challenges. Washington DC, International Monetary Fund.

International Diabetes Federation. (2003). *Diabetes Atlas* (second edition). International Diabetes Federation, Brussels.

Kimmis J, Gottchalk R, Armendariz E, Griffith-Jones S. (2002) Making the case for UK pension fund investment in developing country assets. Institute for Development Studies, University of Sussex, Brighton, July.

Leeder S, Raymond S, Greenberg H, Liu H, Esson K. (2004) A race against time: the challenge of cardiovascular disease in developing economies. New York: Columbia University.

Lobstein T., Baur L., Uauy R.(2004) 'Obesity in children and young people: a crisis in public health'. Obesity Reviews 5(Suppl.1):4-85.

Mackay J, Eriksen M. (2002) The Tobacco Atlas. Geneva, WHO.

Mackenbach, J.P., Cavelaars, A. E. J. M., Kunst, A. E., et al. (2000). 'Socio-economic inequalities in cardiovascular disease mortality. An international study'. *European Heart Journal*; 21, 1141-1151.

Marmot MG. (1978) 'Changing social class distribution of heart disease'. British Medical Journal 1109-1112

Nchinda TC. (2002). 'Research capacity strengthening in the South'. Social Science and Medicine 1699-1711

Popkin BM, Horton S, Kim S, Mahal A, Shuigao J. (2001). *Trends in diet, nutritional status and diet-related noncommunicable diseases in China and India: the economic costs of nutrition transition*. Nutrition Reviews 59: 379-90.

Riemsma RP, Pattenden J, Bridle C, Sowden AJ, Mather L, Watt IS, Walker A. (2002). A systematic review of the effectiveness of interventions based on a stages-of-change approach to promote individual behaviour change. Health Technol Assess. 2002;6(24):1-231.

Stewart, B. W., & Kleihaus, P. (Eds.) (2003). World Cancer Report.

International Agency for Research on Cancer. Lyon, France: IARC Press.

Swiss Reinsurance Company. (2004). Too Big to Ignore: The Impact of Obesity on Mortality Trends. Zurich, Swiss Re, 2004

United Nations Conference on Trade and Development (UNCTAD). (2003). World Investment Report 2003. UNCTAD: Geneva and New York;

WHO-PREMISE (phase I) Study Group. (2004). Gaps in secondary prevention of myocardial infarction and stroke: World Health Organization study on Prevention of REcurrences of Myocardial Infarction and StrokE (WHO-PREMISE) in low and middle income countries. World Health Organization, Geneva.

Wild S, Roglic G, Green A, Sicree R, King H. (2004) *Global prevalence of diabetes: estimates for 2000 and projections for 2030. Diabetes Care* 27:1047-1053.

World Bank. (1999). Curbing the Epidemic: Governments and the Economics of Tobacco Control. Washington DC, World Bank.

World Health Organization. (2002). World Health Report, 2002. Geneva: World Health Organization.

World Health Organization (2003). *World Health Report, 2003.* Geneva: World Health Organization.

Yach D. (1990). 'Tobacco-induced diseases in South Africa'. *Int J Epidemiol* 19(4): 1122-1123.

Yach D, Raviglione M. (2004). *Tuberculosis and tobacco. Evidence-based Health Care*. 2004; 8: 28.

Yach D, Hawkes C, Gould CL, Hofman KJ. (2004) 'The Global Burden of Chronic Diseases: Overcoming Impediments to Prevention and Control'. *JAMA* 291(21): 2616-2622.

Yach D, Hawkes C, Epping-Jordan JE, Galbraith S. (2003). The World Health Organization's Framework Convention on Tobacco Control: implications for the global epidemics of food-related deaths and disease. J Public Health Policy 24 (2&3): 274-290.

Yach, D. (2005). Chronic Disorders: Cardiovascular Disease, Cancer, and Diabetes. In: Social Injustice and Public Health. Edited by Barry S Levy and Victor W Sidel. Oxford University Press. Chapter 14. In press Table 1: Summary of research needs to address chronic disease risks and selected initiatives addressing them

The economic aspects of diabetes care



while type 1 diabetes is growing at a moderate rate in the overall population, type 2 diabetes is experiencing an explosive growth rate. Although essentially all people with type 1 diabetes are appropriately diagnosed, it is estimated that presently more than half of people with type 2 diabetes are unaware they have diabetes.

Factors contributing to this increase in prevalence of diabetes include:

- region growth;
- aging population;
- increase in the number of diagnosed patients;
- more aggressive diabetes screening in the population at large:
- general trend in the western world of a lifestyle with fatty foods and less exercise;
- adoption of the western lifestyle in countries with historically low incidence of diabetes, especially newly developed countries.

According to the most recent research conducted by the International Diabetes Federation (IDF) some 194 million people worldwide, or 5.1% of the adult population, have diabetes. If nothing is done to slow the epidemic, this number is expected to exceed 333 million, or 6.3% by 2025.

The direct annual cost of treatment is at least 153 billion international dollars and may even exceed 286 billion a year. To put this into context, diabetes costs nine times more than asthma, and almost two-thirds of cancer spending.

This exceptional strain on healthcare budgets is set to increase as the number of cases of diabetes continues to increase. The World Health Organisation (WHO) estimates that by the year 2030, the number of people with diabetes will have reached 370 million. The cost of treating these sufferers will mushroom to between 213 and 396 billion international dollars a year by 2025, eating up as much as 40% of some countries' health budgets.

Health impact

In both type 1 and type 2 diabetes, chronically high levels of glucose in the bloodstream can progressively damage nerves and small blood vessels ('microvascular complications'), increasing the risk of complications (statistics below are based on data from economically developed countries):

- ♣ Blindness. Diabetes is the leading cause of new cases of blindness and visual disability in adults in economically developed societies. Findings suggest that, after 15 years of having the condition, 2% of people with diabetes become blind and 10% develop severe visual impairment.
- * Kidney disease. Diabetes is the leading cause of end-

- stage renal disease, accounting for about one-third of new cases.
- Nerve disease and amputations. About 70% of people with diabetes have some degree of nerve damage which, when severe, can lead to lower limb amputation. Diabetes is the leading cause of non-traumatic lower limb amputations.

In addition to these complications, people with type 2 diabetes often have high levels of blood lipids and cholesterol, making their risk of heart disease and stroke ('macrovascular complications') two to four times higher than the risk in people without diabetes.

Healthcare costs

Diabetes is one of the costliest health problems in the world. Few accurate cost figures are available for individual countries, and comparisons are difficult to make because healthcare systems and costs vary from country to country. However, the International Diabetes Federation (IDF) estimates direct costs of diabetes to be approximately 6% of the total health budget of economically developed countries. Their estimate, based on data from 1995, assumes that diabetes affects 6% of the population, on average, and that the overall cost of healthcare for someone with diabetes is 2.5 times more than for a person without the condition. Total direct costs of diabetes are highest in the US, Japan, Germany, and France: 60 billion, 16.94 billion, 10.67 billion and 7.3 billion US dollars, respectively.

The American Diabetes Association (ADA) has compiled more precise and detailed cost figures for the United States, based on data from 1997. They estimate the direct costs of diabetes in the United States to be 44.1 billion dollars. This includes costs for controlling blood glucose (7.7 billion dollars, 17.4%), treating greater-than-normal rates of chronic complications (11.8 billion dollars, 26.8%), and general medical conditions (24.6 billion dollars, 55.8%). On average, people with diabetes in the United States incur nearly four times as much in annual medical expenditures as compared to people without diabetes: 10,071 dollars versus 2,669 dollars per person, respectively.

Although even fewer assessments have been made of indirect costs (those due to lost productivity), most estimates put them as high as or higher than direct costs. For example, indirect and direct costs of diabetes, in US dollars, for the United States, Mexico and Australia, respectively, are estimated to be 54.1 billion and 44.1 billion, 330 million and 100 million, and 280 million and 371 million. ADA's assessment of United States indirect costs includes lost productivity due to disability (37.1 billion dollars) and

premature death (16.9 billion dollars). ADA further estimates that, on average, people with diabetes, age 18 to 64 years, missed 8.3 days of work compared to 1.7 days per year for people without diabetes. In the United States in 1997, a total of 159,719 deaths were attributable to diabetes, representing an estimated loss of two million years of life.

Controlling hyperglycaemia reduces complications

As high blood glucose levels are the root of most of the complications of diabetes, maintaining glycaemic control is central to treatment. Over the years, a number of small studies have suggested that more intensive therapy, to achieve tighter control of blood glucose levels, can prevent or delay the onset of complications – and, therefore, decrease their associated costs. Compared to traditional therapy, intensive therapy involves more careful monitoring of blood glucose levels and administering more frequent doses of insulin (eg, three or more times per day) and/or, in the case of type 2 diabetes, oral antidiabetic drugs. Two large, key studies provided definitive proof that intensive therapy provides significant health benefits over traditional therapy.

The Diabetes Control and Complications Trial (DCCT) showed that, in type 1 diabetes, intensive therapy delayed the onset and slowed the progression of microvascular complications. Risk reductions for various complications ranged from 35 to 75%. Improved glycaemic control was also associated with reduced cardiovascular disease events, but the difference was not statistically significant, possibly because the population studied was young adults.

More recently, the United Kingdom Prospective Diabetes Study (UKPDS) showed similar benefits of intensive therapy for type 2 diabetes. Intensive therapy with insulin and oral antidiabetic drugs decreased the risk of retinopathy, nephropathy, and possibly neuropathy. Overall, the rate of microvascular complications decreased by 25%.

Recent research suggests that controlling the rise in blood glucose following a meal – post-prandial hyperglycaemia – is especially important in reducing the higher risk of cardiovascular disease in individuals with type 2 diabetes. For example, a recent analysis of ten European studies involving more than 22,000 people with type 2 diabetes showed that blood glucose levels two hours after a standard glucose loading test predicted cardiovascular disease mortality better than fasting plasma glucose levels.

Similarly, the landmark DECODE analysis, based on 13 separate studies involving more than 25,000 people with diabetes, showed two-hour post-prandial glucose levels are as significant as systolic blood pressure in predicting all-cause mortality, and are a better predictor of mortality than fasting glucose levels in patients without a history of diabetes.

Cost versus the benefits of intensive therapy

Intensive glycaemic therapy costs more than traditional therapy: 4,000 to 5,800 US dollars, versus 1,700 dollars per year, respectively, according to one estimate. Some

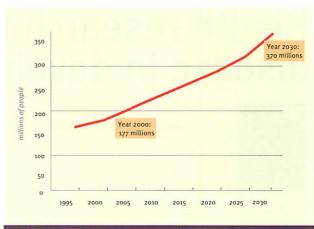


Figure 1: Diabetes prevalence

researchers have examined whether the benefits are worth the extra cost. While there are some differences of opinion due to differing assumptions in the health economics analyses, most conclude that the benefits are well worth the extra expenditure. The conclusion from the UKPDS for people with type 2 diabetes is that 'The additional costs of intensive glucose control are largely offset by significant reduction in the costs of treating complications of diabetes'. For example, in reviewing the literature, one group of researchers noted that intensive therapy costs approximately 20,000 dollars and 16,000 dollars per quality adjusted life year for type 1 and type 2 diabetes, respectively. They concluded that, from an economic perspective, this compares favourably with pharmacological therapy for high-risk individuals with hypertension and hypercholesterolaemia, and that health policy should foster the use of intensive therapy for people with diabetes.

Unfortunately, despite the unequivocal demonstration of the benefits of intensive therapy and the convincing cost-benefit analyses, intensive therapy is not universally accepted by the healthcare system or available to the majority of individuals with diabetes for a number of reasons. Multiple daily insulin injections need adoption and compliance can be difficult; further, intensive therapy requires substantial time, effort, commitment and communication for the patient and physician.

Clearly, the benefits of intensive therapy must be more convincingly communicated to healthcare professionals, managed care organisations and individuals with diabetes. New methods of administering therapy without injections – such as inhaled insulin, which is currently in trials – also hold the promise of making insulin therapy more convenient and less intrusive, promoting greater compliance and more intensive treatment and, in the end, decreasing the risk of diabetic complications and saving lives. \square

NOVO NORDISK

Stefan Björk, PhD

Senior Advisor, Novo Nordisk A/S

Corporate Diabetes Programmes, Corporate Stakeholder Relations

Krogshoejvej 41, DK-2880 Bagsvaerd, Denmark

Email: stbj@novonordisk.com

Web URL: www.novonordisk.com

Health research for cardiovascular disease in developing countries



Article by K Srinath Reddy

n the developing countries, cardiovascular diseases are becoming an increasing public health problem, with serious economic and social consequences.

A hallmark of the ongoing global health transition is the rapid rise in the burdens of cardiovascular diseases (CVD) in the developing countries. CVD is the leading cause of death at the global level. It is also the foremost cause of death in many developing countries and will soon attain that status in several others (World Health Organisation, 2002). Coronary heart disease (CHD) and stroke are the principal CVDs which are increasing in magnitude in the developing regions of the world, which also continue to experience high burdens of rheumatic heart disease (RHD).

In 2002, 16.7 million deaths occurred from CVD, of a global total of 32 million deaths (World Health Organisation, 2003). About 80% of the CVD related deaths and 87% of the CVD related disability now occurs in the low and middleincome countries. Even by the conventional definition of the developing countries, twice as many CVD related deaths occur in those countries as compared to developing countries. Of the 14 million global deaths due to CVD in 1990, about 9 million occurred in the developing countries (Murray and Lopez, 1996). By 2020, these countries are projected to contribute 19 million of the annual global toll of 25 million CVD deaths (Reddy, 2004). While the large populations of the developing countries account for much of these excess absolute burdens, proportional mortality rates (the fraction of all deaths which is attributable to CVD) are also rising sharply in the developing countries. In many developing regions, this proportion would double, from about 20% to about 40%, between 1990 and 2020.

Many of the CVD related deaths in the developing countries occur at a much earlier age than in the developed countries. A large proportion of the victims are middle-aged and in the prime of their working lives. Consequently these countries experience a large loss in productive years of life (See Figure 1). This will be further compounded as the epidemics of CVD advance across these regions by 2020 (Leeder et al., 2004). Such a large burden of premature death and disability not only has serious adverse consequences for the affected individuals and their families but also undermines national development. The loss of a skilled factory foreman due to a heart attack at the age of 45 years in India not only impairs

productivity but also imperils the education of his children. A fatal or disabling stroke due to uncontrolled high blood pressure in a 50 year old woman in Sub-Saharan Africa may snatch away the only surviving care giver of her young grandchild who has already lost her parents to HIV-AIDS.

Risk factors of CVD are rising in magnitude in populations of all developing countries, portending a major increase in future burdens of disease (Reddy, 2002). Proportions of people with a tobacco habit, physical inactivity, high blood pressure, overweight, diabetes, and abnormal blood lipids are increasing in these countries, placing many individuals at a high risk of developing CVD over the next ten years.

As the CVD epidemics advance, all sections of the society are affected. In the more matured forms of the epidemics, the poor will become the vulnerable victims both because of factors which increase exposure to risk (inability to access knowledge; economic factors which promote consumption of unhealthy foods and reduce availability of healthy foods at affordable prices; higher levels of tobacco consumption) as well as decreasing access to healthcare (high cost of diagnosis and treatment for risk factors as well as diseases). As the health transition rapidly transforms the global profile of dominant diseases, the poor among countries and the poor within countries are becoming the major victims of CVD across the world.

Impact of health transition

While the pattern of health transition, with respect to the overall burdens and different types of CVD, is similar to that observed in the developed countries, the dynamics are also distinctively different in the developing countries, in several respects. The time-frame of transition is highly compressed, with a rapid shift to chronic diseases like CVD occurring in a few decades rather than over a century. This leaves the health system unprepared to cope with the rapidly rising demands.

The developing countries also have to contend simultaneously with multiple threats to health (the unfinished agenda of infectious diseases and nutritional deficiencies; the escalating burden of chronic diseases like CVD, diabetes, cancers and lung disorders; the rising toll of accidental and non-accidental injuries and the rampant spread of HIV AIDS). While urbanisation in the West occurred alongside growing economic prosperity, urbanisation in the developing countries

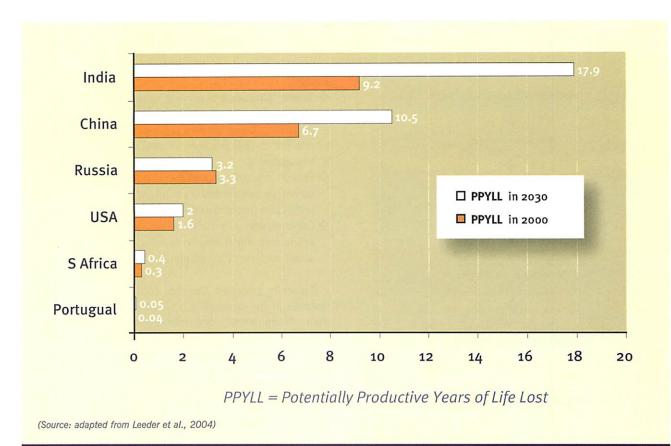


Figure 1: Years of life lost due to CVD in populations aged 35 - 64 years

is taking place amidst growing debt burdens, increasing inequities and widespread poverty. All of these factors make it extremely difficult for countries with scarce resources to cope with the rising requirements of costly clinical care for manifest CVD and threaten to overwhelm the health systems which are inadequately resourced to meet these multiple demands.

A comprehensive public health response is needed, utilising the wide body of available knowledge on risk factors and effective interventions for prevention and risk reduction

This global threat to public health warrants a global thrust to effectively counter it. A comprehensive public health response must aim to prevent the acquisition of risk by groups not yet exposed to it (such as children and rural populations), reduce risk exposure levels in populations who are already exposed (such as urban populations), identify individuals at high risk through easily applicable low-cost diagnostic algorithms, reduce risk through an appropriate mix of interventions (lifestyle measures in all, supplemented by less expensive drugs where needed) and provide for life saving acute care which reduces mortality of acute heart attacks and strokes. All of these need to be provided to the community in an easily accessible and affordable manner and must be integrated into primary health care services.

Research, conducted in many populations across the world, has provided ample evidence of the 'risk factors' which cause CVD and of effective interventions which can

prevent or reduce risk, across populations and in individuals at high risk. Tobacco use, unhealthy diets and physical inactivity account for most of the risk which underlies the occurrence of heart attacks and strokes. These behavioural factors influence the levels of biological risk factors like blood pressure, body fat, blood lipids and blood glucose. These in turn determine the risk of clinical disease and adverse events. 'Upstream determinants' which impact upon behaviours include socioeconomic and cultural factors related to urbanisation, industrialisation, globalisation and trade.

Interventions which can influence these multiple determinants to prevent or reduce the risk of CVD include:

- policy interventions (such as those related to tobacco control, production and supply of healthy foods, regulation of unhealthy foods and urban planning which promotes physical activity);
- represent of communities through health promotion programmes (which enhance knowledge, motivation and skills which foster awareness and adoption of healthy behaviour):
- early detection of individuals at high risk of developing CVD (due to modest elevations of multiple risk factors or marked elevation of a single risk factor) and effective interventions to decrease those risks (by reducing blood pressure, blood cholesterol, blood glucose, overweight and promoting tobacco cessation, physical activity and healthy diets):
- secondary prevention in persons who have developed CVD (by using similar measures but also employing effective drugs with proven survival benefits, such as aspirin, beta



blockers, ACE inhibitors, statins and diuretics); and providing appropriate acute care (such as the use of aspirin in suspected heart attack, which can reduce mortality by about 25%).

Evidence from observational epidemiology and clinical trials clearly indicates that much of CVD related burdens can be avoided through such effective interventions. Risk factor declines, in populations, have led to steep declines in CVD mortality rates and effective control of blood pressure and cholesterol, along with the use of aspirin have been associated with mortality reductions of 25 to 40 % in persons with a high risk of CVD.

Research is needed to effectively apply this knowledge in the developing countries

While much of the global information gathered about the causation and prevention of CVD is applicable to the developing countries and can form the basis for initiating public health action, research is required to enable the effective introduction and implementation of programmes for CVD prevention and control.

Research is needed to:

- Enable application of existing knowledge for the control of cardiovascular disease in developing countries through population-based primary prevention strategies and costeffective clinical practices for case detection and management.
- Provide presently unavailable information related to the burden of disease and levels of conventional risk factors, within and across countries and changes over time.
- Generate new information related to other cardiovascular risk factors which may be especially relevant to different social contexts or varied ethnic groups.

Research priorities for the control of cardiovascular diseases in the developing countries are operational rather than fundamental. So, rather than focus attention preferentially on new treatments for disease or new causes of disease, research is required to determine how best to utilise existing knowledge to develop intervention programs appropriate for use in resource-poor settings. The interventions need to be evidence based, context specific and resource sensitive. Operational research is essential for the design and evaluation of such interventions.

A large armamentarium of effective interventions for prevention and treatment has been developed and tested in randomised controlled trials, and safe, effective medications are now available at low cost. However, there is little or no reliable evidence available about which interventions should be prioritised in different demographic, epidemiological and economic circumstances or about how best to deliver these interventions in a range of different low- and middle-income countries with varying health systems. Research focused on this question would directly inform policies about global and regional responses to cardiovascular disease and its risk factors like: tobacco consumption, high blood pressure and diabetes.

Support for the development of research capacity and for the strengthening of research institutions is also a priority. The priorities for capacity development and institutional strengthening in low- and middle-income countries, like the priorities for research itself, are operational rather than fundamental. The focus should be on providing skills in epidemiology, health services research, health economics and clinical research, and fostering centres of excellence in these disciplines.

Role of the Initiative for Cardiovascular Health Research in the developing countries

There is an urgent need for research on sustainable models of disease prevention that can be delivered through primary health care in a variety of resource-poor settings. While much is known about the elements required for effective and safe prevention, little is known about how to deliver these reliably and affordably in new disease epicentres such as India, China and South America. If this could be achieved on a large scale

throughout low- and middle-income countries, several million people would be saved each year from death or disability during the most economically productive years of their lives.

The Initiative for Cardiovascular Health Research in Developing Countries (IC Health) of the Global Forum for Health Research was born in 1999, in response to this need. It is a global partnership programme which works to stimulate, support and strengthen health research relevant to the prevention and control of cardiovascular diseases in the low and middle income countries of Africa, Asia, Central and Latin America and the Middle East (www.ichealth.org). Its multi-institutional character brings together health research institutions, international organisations and global health NGOs to provide a platform for collaborative efforts intended to catalyse policy and programme relevant research in prioritised areas of need and potential impact.

The mission of IC Health is to support the conduct of policy-relevant research, development of research capacity and strengthening of research institutions in an effort to reduce the burden of cardiovascular disease and diabetes in low- and middle-income countries.

- The principal areas of IC Health activity include:
- Operational research with a focus on cardiovascular risk reduction in primary health care settings.
- Policy research with a focus on macroeconomic and developmental consequences of CVD in developing countries and evaluation of policy interventions as instruments for CVD prevention.
- Analytic studies appraising the coverage, content, resource flows and products of current CVD related research in developing countries and preparation of research road maps.
- Capacity building for research through training in research methodology, cardiovascular epidemiolog and health economics.

IC Health is presently managed on behalf of the Global Forum for Health Research by a multi-institutional Foundation Council, which steers the Initiative through an Executive Committee. The Secretariat, located in New Delhi, has technical and administrative units to plan, coordinate, monitor and manage research programmes and conduct donor engagement. An International Scientific Advisory Committee provides expert scientific review and guidance, while global and regional research networks in developing countries are engaged and enabled by the Secretariat to undertake research related to IC Health programmes.

The activities and accomplishments of IC Health, so far, include:

- Establishment of global and regional research networks.
- Research studies on:
 - a) Macroeconomic effects of CVD on developing countries (global overview completed; in-depth country studies initiated)

- b) Interventions for cardiovascular risk reduction in primary health care settings of developing countries.
- c) Assessment of Capacity for CVD prevention and control in India, Cameroon and Thailand.
- d) Interventions for tobacco control in developing countries.
- e) Practice patterns of management of acute coronary syndromes at various levels of healthcare in developing countries.
- Conduct of research prioritisation and design workshops on Capacity Assessment (2000), Prevention and Control of High Blood Pressure (2001), Cardiovascular Risk Reduction in Primary Health Care (2003) and interventions for tobacco control (2003) – the products of these workshops are in public domain and have been utilised by national researchers, research networks and partners such as WHO to initiate research programmes.
- Support for capacity building programmes which promote research capacity related to CVD prevention and control.
- Global advocacy for increased recognition of and response to the high CVD burdens in developing countries.
- Leveraged support for independently funded research projects such as CVD risk factor surveillance in India, high blood pressure control in Africa, global comparative studies on cardiovascular risk factors (INTERHEART and Eastern Collaborative Study on Stroke).

IC Health has initiated an innovative funding programme for research facilitation which sequentially involves: identification of research priorities through workshops involving experts from developing and developed countries; peer reviewed and competitively awarded proposal development grants for developing research proposals, in the prioritised areas, over six months; further selection of these proposals for start-up grants (for Pilot/Phase 1 studies) to be completed in one year); review of these results and further facilitation to connect with major donors for project grants to fund the definitive studies (see Figure 2). This programme is intended to support developing country researchers who lack the initial resources to develop project proposals for seeking funds from major donors.

K Srinath Reddy trained in clinical cardiology (All India Institute of Medical Sciences, New Delhi) and epidemiology (McMaster University). He received the WHO Director General's Award for outstanding contributions to global tobacco control in 2003, and is a consultant to WHO and the World Bank on non-communicable diseases, nutrition and tobacco control. He is the coordinator of the Initiative for Cardiovascular Health Research in Developing Countries and is presently heading the Department of Cardiology at the All India Institute of Medical Sciences.

References

Leeder S, Raymond S, Greenberg H, Liu H, Esson K, 2004. A race against time. The challenge of cardiovascular disease in developing countries. New York, NY: Columbia University.

Murray CJL, Lopez AD, 1996. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge, Mass: Harvard University Press.

Reddy KS, 2002. 'Cardiovascular diseases in the developing countries: dimensions, determinants, dynamics and directions for public health

action'. Public Health Nutr. 5, 231-237

Reddy KS, 2004. 'Cardiovascular Disease in Non-Western Countries'. N.Engl. Med. J 350, 2438-2440

World Health Organization, 2002. The World Health Report 2002. Reducing risks, promoting healthy life. Geneva: WHO.

World Health Organization, 2003. *The World Health Report 2003*. *Shaping the Future*. Geneva: WHO.

Child health: how can health research make a difference?

Article by Zulfigar A Bhutta and Seema Lassi

hildhood illnesses, especially those that afflict children under-five years of age, comprise about 29% of global burden of disease and almost a fifth of the burden of mortality (Black, Morris and Bryce, 2003). In the year 2003, a series of articles (Jones et al., 2003; Bryce et al, 2003; Victora et al., 2003; Claeson et al., 2003) were published in The Lancet by The Bellagio Child Survival Study Group, which reviewed the global child survival situation and strategies. The Bellagio Child Survival Group indicated that annually 10.8 million children died before reaching five years of age, of which a large proportion died within the first four weeks of life, i.e. the neonatal period. Merely ten countries of the world accounted for almost 80% of the entire burden of global mortality and the bulk of these deaths were concentrated in sub-Saharan Africa and south Asia (Black, Morris and Bryce, 2003). These data are corroborated by the World Health Organization indicating that the burden of child mortality is highest in AFRO, SEARO and EMRO regions (see Figure 1). Notwithstanding these alarming figures, there are indications that child health has improved overall, and considerable gains have been achieved in few global regions over the years; however the present reduction might be reversed due to the recent resurgence of malaria and HIV/AIDS, especially in sub-Saharan, Africa.

Unaddressed problems in global and regional estimates of child mortality

Despite the recent global data generated by The Bellagio Child Survival Group, there are sparse data from routine nationally representative vital registration systems and regionally representative mortality estimates are also hard to come by. The epidemiological evidence base for the distribution of child mortality by cause is inadequate to support sound public health decision making in many developing countries. In particular, the yawning gap in information for the burden of intrauterine growth retardation, perinatal and neonatal mortality has been a key factor in the lack of recognition of the importance of these issues for infant mortality (Bhutta et al., 2004). A large number of newborn deaths go unreported due to the high proportion of domiciliary births. In addition many fresh intra-partum stillbirths, which represent preventable deaths of viable fetuses, are not even included in the global burden of disease estimation.

Co-morbidity is another significant indicator which is not dealt with adequately by majority of studies. The data on global burden of childhood diseases do not consider any of the long-term effects of major childhood diseases, which may have enormous impacts on public health. In particular, the area of fetal origins of malnutrition and long-term effects on adult diseases needs to be studied extensively in developing countries.

Implications for reaching the Millennium Development Goals for child survival

Given the current trends of reduction of child mortality in parts of the world, it is exceedingly unlikely that the Millenium Development Goals (MDG) targets of reducing the 1990–91 levels of child mortality by two thirds by 2015 will be achievable. These targets are reachable provided that we invest in making maternal and child health central to the health policy agenda, ensuring that interventions target populations in greatest need in an equitable fashion and

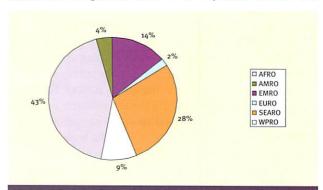


Figure 1: Burden of U5 mortality according to WHO regions

promoting relevant health systems research. The latter is critical to inform policy and programmes. Given the importance of research in affecting policy and outcomes, it is critical that interventions are evidence-based and as much as possible adapted to local circumstances.

Unfortunately, global research into problems of childhood illness and mortality has received very little attention in recent years. While this may be related to the overall situation of funding for health research (mainly due to the failure to establish an equitable and transparent global process for priority setting in health research), even the

available scarce resources are sub-optimally utilised.

Globally less than 10% of the global research funds are devoted to addressing issues that afflict over 90% of the world's health problems. Pragmatically, given the limited resources available for child health and survival research overall, it is imperative that such research must be targeted to priority areas and critical gaps.

Research gaps in child health and survival

It was also highlighted that we already knew sufficient about potential solutions to these problems and available low-cost interventions could potentially prevent 63% of these child deaths (Jones et al., 2003). The challenge however was to make these low-cost interventions available to those who needed them most. This challenge of scaling-up and making a difference has also highlighted the major gap that exists between the kind of research and evidence that is needed to drive policy.

Most public health interventions and research needs to develop and proceed through an orderly system of scientific research and development. Such a pathway consists of bench-top research proceeding to proof-of-principle pilot studies and then appropriately sized efficacy studies in multiple settings. However, given the importance of introducing these interventions in public health systems, it is critical to generate evidence from appropriate large-scale effectiveness trials or demonstration projects. Although relatively expensive and difficult, it is precisely the lack of information from such levels of evidence that fails to inform policy and facilitate the introduction of necessary interventions at scale. Faced with the dilemma of doing 'something' in the wake of limited evidence, many development agencies take the easy route of developing and instituting vertical programmes, which fail to address issues of health systems and have a relatively finite life, usually until the end of the donor-assisted programmes themselves.

We undertook an evaluation of the major research gaps and issues that may relate to child survival using an evaluation matrix modified from the five step priority setting process of the Global Forum for Health Research (Global Forum for Health Research, 2004) and a recent research evaluation undertaken by the WHO (World Health Organization, 2004). This exercise was undertaken to identify the knowledge gaps related to priority issues in child health, evidence for future research and allocation of limited resources effectively for maximum impact in this area.

The major areas of focus for the child survival report included all the principal causes of under-five child mortality identified by the Bellagio Child Survival Group, such as acute respiratory infections (ARI), diarrhea, malaria, HIV/AIDS, measles and neonatal deaths. We reviewed PubMed/MedLine with the terms 'major childhood illnesses', 'child mortality', 'diarrhea', 'ARI', 'measles', 'malaria', 'HIV/AIDS', "systematic reviews for major childhood diseases', etc. We also did an extensive internet search of WHO, UNICEF and other websites for reviews and reports of major childhood illnesses, their control and elimination. Many reports were identified from cross-checking the references identified through initial

searches. All literature so identified was perused and extracted using a standardised format. Further details of available systematic reviews in key areas within the Cochrane Library are provided in Table I. Figure 2 indicates the various levels of evidence available in the Cochrane data base and library for several key child survival areas. As can be seen there is a remarkable paucity of data from appropriately designed randomised trials in representative communitysettings.

Table 2 indicates our assessment of the major areas that relate to current evidence gaps for major causes of child mortality. There are many evidence gaps in key areas pertaining to the burden of disease as well as factors that predispose to illness. While there is sporadic research related to determinants of disease, few large-scale trials have explored the scientific basis for interventions based on preventive strategies. To illustrate, while there are over 150 public health interventions studies for the management of childhood diarrhea in Pakistan, less than five have evaluated primary preventive strategies such as safe water, sanitation and hand washing.

Research is required to develop community-based interventions to address leading determinants. For the area of materno-fetal malnutrition it is critical to develop and implement maternal and infant nutrition programmes in the developing world where the majority of reproductive age women are malnourished. Ascertaining maternal micronutrient deficiencies, genetic factors predisposing to intrauterine growth retardation as well as other determinants of pre-term delivery is critically important. Research is urgently required to determine the fetal origin of adult diseases. In settings with high prevalence of HIV/AIDS, the issue of breast-feeding needs to be addressed, especially in areas where breast-feeding substitutes are not available. Child feeding requires appropriate instruments to assess current practices and development of indicators to monitor the impact of programmes designed to improve them.

How do we develop solutions for priority problems?

While the scientific literature highly acknowledges the availability of cost effective childhood interventions for major childhood diseases, major gaps have been identified at the level of service delivery. For several decades there has been relatively little change in perinatal and neonatal mortality rates in many developing countries, nor have rates of materno-fetal malnutrition reduced significantly.

It must be emphasised that major childhood diseases are preventable; any reduction in childhood mortality will surely have a positive effect on global mortality rates. Life-saving interventions are available but research is required to develop strategies for proper implementation and evaluation. Research is required for effective interventions to break the vicious cycle of low birth weight and malnutrition and ways make them sustainable for developing countries. Due to the high prevalence of domiciliary births in developing countries, a large number of perinatal and neonatal deaths escape diagnosis; there is a greater need to focus on community

	year	No. of	Developing	Developed	Sample size	Community	Hospital	Reference
Diarrhea		Trials				setting	setting	
Effects of				T			1	
antibotics for Salmonella ⁸	2003	6	5	1	258	0	6	Sirinavin and Garne, 2003
Rice based/ Glucose based ORS ⁹	2003	22	22	0	N ot mentioned	0	22	Fontaine, Gore and Pierce, 2003
Reduced osmolarity ORS for								Hahn, Kim and Garne, 2003
treating diarrhea 10	2001	14	1	13	2297	N /M	N /M	
Oral immunoglobulin for prevention of Rotavirus infection in LBW ¹¹	2002	1	o	2	75	o	1	Mohan and Haque, 2003
ARI								
Antibiotics for Otitis media 12	200							Glasziou et al, 2003
Antibiotics for	2003	7	0	7	562	0	7	Marris et al. ages
hinosinusitis 13	2003	6	0	6			6	Morris et al, 2003
Antibiotics for preventing pneumonia in children with measles ¹⁴	2001	6	1	4	1304	0	6	Shann, D'Souza and D'Souza, 2003
Efficacy of Acyclovir for Chickenpox 15	2001	3	0	3	979	0	3	Klassen et al, 2003
Efficacy of Hib Conjugate vaccine 16	2003	4	3	1	257,000	0	4	Swingler, Fransman and Hussey, 2003
mmunoglobulins for preventing respiratory								Wang and Tang, 2003
syncytial virus nfection 17	2001	4	N /M	N /M	2598	N /M	N /M	
Neuraminidase Inhibitors for Influenza treatment Or prophylaxis ¹⁸	2003	3	0	3	1500	0	3	Matheson et al, 2003
Pneumacoccal	2002	10	10	0	40863	0	10	Straetemans et al, 2003
vaccines for Preventing a cute Otitis Media ¹⁹								
Polysaccharide vaccines for oreventing serogroup A meningococcal meningitis ²⁰ Measles	2001	8	6	2	N ot mention ed	6	2	Patel and Lee, 2003
/itamin A for								l pre
reating measles ²¹ Malaria	2000	7	5	2	1628	1	5	D'Souza and D'Souza, 2003
Amodiaquine for reating malaria	2003	56	56	0	2429	N /M	N /M	Olliaro and Mussano, 2003
nsecticide treated ped nets and curtains					-4-7			Lengeler, 2003
or preventing nalaria 23	1998	18	18	0	> 78151	18	0	
ron chelating agents for treating Malaria 24	2003	7	0	7	570	0	7	Smith and Meremikwu, 2003
accines for 25	2002	18	2	16	10, 971	16	2	Graves and Gelband, 2003
VIF								
Antiretrovirals for MTCT of HIV								Brocklehurst and Volmink, 2003
nfection 26	2002	8	2	6	6946	0	8	
otrimoxazole prophylaxis for HIV pportunistic nfection ² 7	2002	o	o	0	0	0	o	Grimwade and Swingler, 2003
ritamin A supplementation for reducing MTCT								Shey Wiysonge, Brocklehurst and Sterne, 2003
of HIV infection 28		2	2	0	1813	N /M	N/M	
Decongestants and antihistamines for acute Otitis media ²⁹	2001	13	0	13	2569	0	13	Flynn, Griffin and Tudiver, 2003

NM: Not mentioned

Table 1: Cochrane Systematic Reviews for major causes of under-5 mortality

Types of knowledge needed Child Health 1. Considerable gaps in information relating to the burden of perinatal and neonatal deaths globally, especially from Priority problems 1. Global burden of disease estimates representative community settings with high proportion of domiciliary births 2. The exact attribution of malnutrition especially micronutrient malnutrition to child health and mortality is unclear. This is especially so for young infants and newborn infants. 3. The exact contribution of fetal malnutrition and prematurity to child health outcomes is unclear. Especially the link between maternal and fetal malnutrition and long-term outcomes in population settings is poorly researched in developing countries. The exact burden of mother-to-child transmission and childhood HIV infections in endemic areas is uncertain and available figures may not represent the situation in community settings. 5. The link between early childhood morbidity and malnutrition, early childhood development and long-term developmental outcomes is poorly researched but may potentially have huge implications for societal health and development. Solutions to priority problems 1. Effective/cost-effective prevention options 2. Effective/cost-effective diagnostic tests Effective/cost-effective prevention options 1. Relatively few studies have addressed the issue of prevention of fetal malnutrition and low birth weight prevention in 2. Effective/cost-effective diagnostic tests 3. Effective/cost-effective treatment options community settings through cost-effective interventions, especially through integrated maternal and newborn health programmes. 2. Preventive strategies for key micronutrient deficiencies e.g. iron and zinc deficiency at population level are poorly developed and researched. Given the burden of micronutrient deficiencies in infancy and poor quality complementary foods, the strategies for preventing micronutrient deficiencies at population level are unclear and very poorly researched. Apart from exclusive breastfeeding, relatively few prevention strategies for the prevention of early neonatal and infant bacterial infections have been evaluated in health system settings, especially in HIV endemic areas. . The contribution of early Helicobacter pylori infection to childhood diarrhea and malnutrition is unclear There are few studies of low-cost vaccination strategies for preventing key childhood infections in developing countries as most combination and conjugate vaccines being developed target populations in developed countries. Many major causes of childhood morbidity and mortality in developing countries have yet to see an effective vaccine in Phase 2 or 3 trials (e.g. Shigellosis, typhoid fever in young children, Escherichia coli diarrhea). 7. There is an urgent need to strengthen IMCI programmes and to ensure its application within health systems. Further evidence is needed as to the benefit of community IMCI strategies. 8. Postnatal transmission of HIV infection through breastfeeding in endemic areas remains an important problem. There is a need to improve the safety of breast-feeding in settings with high prevalence of HIV and where, alternatives to breastfeeding are not possible 9. There is a need to identify testing indicators and tools for assessing complementary feeding practices for promotion and monitoring. Effective/cost-effective diagnostic tests 1. There are few rapid diagnostic tests for differentiating acute pyrexia (without localising features) among children in developing country settings e.g. a low-cost fever test that might allow differentiation of malaria, dengue and typhoid fever There are few non-invasive tests or measures of key micronutrient deficiencies nor tests that may yield sensitive surrogate markers. This is a major impediment to recognising and preventing sub-clinical micronutrient deficiencies. 3. Blood cultures in developing countries still pose a huge logistic challenge and also impede the development of strategies that may reduce inappropriate antimicrobial prescribing. There is the need to develop rapid and low-cost bacteriological diagnostic culture methods that can be used in developing countries. 4. The burden of viral infections causing early childhood infections (CNS, acute respiratory and diarrheal illnesses) is uncertain. There are few rapid diagnostic methods that allow them to be used in public health settings. Effective/cost-effective treatment options 1. There are few studies evaluating low cost and effective treatment options for neonatal infections in population settings especially the potential role of domiciliary therapy. 2. Given the burden of neonatal problems (contributing to almost 50–60% of all infant deaths), there is an urgent need to develop and pilot test simple neonatal management protocols in representative health system settings 3. There are only a handful of studies that have evaluated treatment options for micronutrient deficiencies (especially multiple micronutrient deficiencies) in population and health system settings. Especially treatment options in young infants are 4. Given the predominance of child health problems in domiciliary settings, there is a need to develop simple diagnostic and treatment algorithms that can be used by first-level health workers to manage problems in settings where referrals may not be possible 5. The impact of community management strategies of ARI and malaria on antimicrobial and drug-resistance patterns of organisms needs further evaluation. 6. The above must also be complemented by appropriate management strategies for common childhood illnesses in health system settings. There is evidence that current management protocols can be improved further in first and second level health facilities in health systems. Mechanisms to bring about change Mechanisms to bring about change (the following intervention strategies have been poorly evaluated) 1. Few behaviour change and modification strategies especially for diarrheal disease prevention. 2. Better algorithms for the recognition of serious illness in young infants by parents and first level care providers. 3. Strategies to improve case management by health care professionals in primary care settings. 4. Improved home care and care seeking for common childhood illnesses (especially ARI and febrile illnesses). 5. Improved and effective communication strategies for nutrition education (especially for complementary feeding and · General public/at risk Patients Clinicians o Training, o Guidelines, o Care prompts, o Incentives, o Monitoring Health-system/NGO managers domiciliary nutrition rehabilitation) 6. Health intervention strategies that may improve health system performance (e.g. NGO ownership, public-private Public policymakers partnerships etc). These have not been systematically studied at scale in developing countries. 7. Innovative cost-sharing and funding programmes for child health especially those with incentives for improved performance. 8. Little data on why evidence-based health policy making is still not the norm and measures as to how best to bridge the General public/at risk Patients Clinicians research-to-policy gap. Local context for change Issues of concern Capacity to employ particular solutions o Human resources o Infrastructure 1. Research is required to better understand local beliefs and practices, and the potential motivation for change, so that

- - o Money
- Capacity to employ particular mechanisms to bring about change
 - o Human resources
 - o Infrastructure
 - o Money

- effective behaviour change strategies can be developed and evaluated.
- To understanding the determinants of care seeking behaviour of newborns, which is particularly critical for developing interventions.
- 3. To identify acceptable and sustainable child health interventions, develop strategies for implementation in a broader context
- of maternal and child health and ways to integrate it with existing safe motherhood, IMCI and, child survival programmes. 4. Research is fundamental to reduce urban/rural health disparities for service delivery, accessibility and utilisation.
- 5. The current resource flow is inadequate to control global child mortality, especially in developing countries where 98% of it occurs. Additional resources have to be made available by increased international funding, infrastructure, expertise and the
- Gaps for translating research findings to effective health programmes, at the level of health ministries, stake holders and program managers for prioritising scarce resources.
- Inequity of research funds '10/90 gap' for high mortality diseases should be addressed at global level.
- 8. To determine gaps for lack of comprehensive approach at all levels for reduction in childhood mortality.
- 9. Gaps were identified for integrated approach for prevention and management of childhood illnesses at the community and
- 10. There is an urgent need to develop relative indigenous and appropriate health research to formulate policy reforms.

Table 2: Identifying knowledge gaps for major causes of child mortality

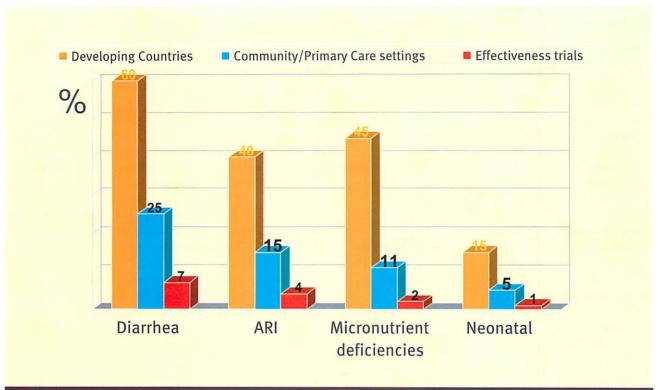


Figure 2: Anyalsis of systematic reviews for child health interventions

mobilisation and to develop algorithms for better case management at primary care level.

The research gaps identified include many of the proximal determinants if health that are fundamental to preventive strategies. These include systemic issues such as poverty, illiteracy and status of women in society (Bhutta, 2004). A key research gap also exists with regards to the evidence around scaling-up interventions and increasing access. In other words while we have sufficient knowledge in most areas, it is the 'know-do' gap that impedes progress in many instances. In the context of the MDG targets, unless there is a focus on application of available interventions and their availability to sections of the population that matter, none of the maternal and child health targets can be met.

Conclusions

In summary, child survival must become a major focus of interventions for developing countries in the context of achieving MDG targets for child health. While we have attempted to identify the most important research gaps that

are needed to inform policy and generate the evidence base for interventions, we are cognisant of the fact that child survival has slipped down in the global priority agenda. Our report underscores the importance of continued research as a key element to maintain and to further improve the existing gains in child survival. It highlights the gaps in information relating to disease burden and interventions and also research on the environment and socio-behavioural

Zulfiqar A Bhutta is the Husein Lalji Dewraj Professor of Pediatrics and Child Health at the Aga Khan University in Karachi, Pakistan. He is actively involved in child health research globally, is a member of The Bellagio Child Survival Group and the Technical Steering Committee for Child and Adolescent Health (WHO), and a Board member of the Child Health and Nutrition Initiative of the Global Forum for Health Research.

Seema Lassi is a Research Fellow in the Department of Pediatrics at the Aga Khan University.

References

Bhutta ZA, 2004. 'Beyond Bellagio: addressing the challenge of sustainable child health in developing countrie's. *Arch Dis Child* 89:483-487.

Bhutta ZA, De Silva H, Awasthi S, Gupta I, Hussain SM, Manandhar D, Salam MA, 2004. 'Maternal and Child Health: Is South Asia ready for change?' *BMJ* 328:816-9.

Black RE, Morris SS, Bryce J, 2003. 'Where and why are 10 million children dying every year?' Lancet 361:2226-2234.

Brocklehurst P, Volmink J, 2003. 'Antiretrovirals for reducing the risk of motherto-child transmission of HIV infection (Cochrane Review).' In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Bryce J, el Arifeen S, Pariyo G, Lanata C, Gwatkin D, Habicht JP, 2003. 'Reducing child mortality: can public health deliver?' Lancet 362:159-164.

Claeson M, Gillespie D, Mshinda H, Troedsson H, Victoria CG, 2003. 'Knowledge into action for child survival.' *Lancet* 362:323-327.

D'Souza RM, D'Souza R, 2003. 'Vitamin A for treating measles in children (Cochrane Review).' In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Flynn CA, Griffin G, Tudiver F, 2003. 'Decongestants and antihistamines for acute otitis media in children (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Fontaine O, Gore SM, Pierce NF, 2003. 'Rice-based oral rehydration solution for treating diarrhoea (Cochrane Review).' In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Glasziou PP, Del Mar CB, Sanders SL, Hayem M, 2003. 'Antibiotics for acute otitis media in children (Cochrane Review).' In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Global Forum for Health Research, 2004. The 10/90 Report 2003-2004. Global Forum for Health Research, Geneva.

Graves P, Gelband H, 2003. 'Vaccines for preventing malaria (Cochrane Review)'. In: *The Cochrane Library,* Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Grimwade K., Swingler G, 2003. 'Cotrimoxazole prophylaxis for opportunistic infections in children with HIV infection (Cochrane Review).' In: The Cochrane Library, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Hahn S, Kim S, Garner P, 2003. 'Reduced osmolarity oral rehydration solution for treating dehydration caused by acute diarrhoea in children (Cochrane Review)'. In: *The Cochrane Library,* Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS, 2003. 'How many child deaths can we prevent this year?' *Lancet* 362:65-71.

Klassen TP, Belseck EM, Wiebe N, Hartling L, 2003. 'Acyclovir for treating varicella in otherwise healthy children and adolescents (Cochrane Review).' In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Lengeler C, 2003. I'nsecticide-treated bednets and curtains for preventing

malaria (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons. Ltd

Matheson NJ, Symmonds-Abrahams M, Sheikh A, Shepperd S, Harnden A, 2003. 'Neuraminidase inhibitors for preventing and treating influenza in children (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Mohan P, Haque K, 2003. 'Oral immunoglobulin for the prevention of rotavirus infection in low birth weight infants (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Morris P, Leach A, 2003. 'Antibiotics for persistent nasal discharge (rhinosinusitis) in children (Cochrane Review)'. In: The Cochrane Library, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Olliaro P, Mussano P, 2003. 'Amodiaquine for treating malaria (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Patel M, Lee CK, 2003. 'Polysaccharide vaccines for preventing serogroup A meningococcal meningitis (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Shann F, D'Souza RM, D'Souza R, 2003. 'Antibiotics for preventing pneumonia in children with measles (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd

Shey Wiysonge CU, Brocklehurst P, Sterne JAC, 2003. 'Vitamin A supplementation for reducing the risk of mother-to-child transmission of HIV infection (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Sirinavin S, Garner P, 2003. 'Antibiotics for treating salmonella gut infections (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Smith HJ, Meremikwu M, 2003. 'Iron chelating agents for treating malaria (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Straetemans M, Sanders EAM, Veenhoven RH, Schilder AGM, Damoiseaux RAMJ, Zielhuis GA, 2003. 'Pneumococcal vaccines for preventing otitis media (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd

Swingler G, Fransman D, Hussey G, 2003. 'Conjugate vaccines for preventing Haemophilus influenzae type b infections (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

Victora CG, Wagstaff A, Schellenberg JA, Gwatkin D, Claeson M, Habicht JP, 2003. 'Applying an equity lens to child health and mortality: more of the same is not enough'. *Lancet* 362:233-241.

Wang EEL, Tang NK, 2003. 'Immunoglobulin for preventing respiratory syncytial virus infection (Cochrane Review)'. In: *The Cochrane Library*, Issue 4, 2003. Chichester, UK: John Wiley & Sons, Ltd.

World Health Organization, 2004. 'Knowledge for better health', (forthcoming).

The current state of mental and neurological research



Article by Rachel Jenkins (pictured), Florence Baingana and Don Silberberg

ental and neurological disorders contributed 13% of the global burden of disease in 2001 (World Health Report 2002), estimated to rise to 14.6% in 2020; four of the ten leading causes of disability, and 28% of years of life lived with a disability. Stroke, in addition to causing disability among survivors, is the second to fourth leading cause of death after the age of five years, in virtually all countries. Depression is the fourth leading cause of total disease burden, contributing 4.4% of the DALYs and more than 12% of years of life lived with a disability. Depression is not just a significant problem in the west. One study in Ethiopia found the depression contributed 7% of the disease burden using DALYS (Abdulah et al, 2001). This is likely to be an underestimate and, indeed, it has been argued that a better estimate of the contribution of nervous system disorders to years of life lived with a disability is 28% (Bergen and Silberberg, 2002).

Inadequately treated epilepsy remains a major problem; approximately 60 million individuals with epilepsy reside in developing countries, where up to 90% remain untreated.

Behavioural problems add to the burden – unsafe sex 2.9%, alcohol 3.5% and tobacco 3.3% (for year 2000, WHO, 2002). For comparison with infectious diseases, TB contributes 2.5%, measles 1.8% and malaria 2.9%.

Suicide is estimated as the fifteenth leading cause of death. Recorded suicide rates vary from country to country and are either simply not measured or are recorded badly in a number of regions of the world, especially in sub-Saharan Africa. Where studies of suicide have been carried out, rates in lowand middle-income countries parallel those in much of the West (Moshiro et al., 2001). Rates are high in Eastern Europe, China, Sri Lanka, and represent a very significant mortality. (Hawton and Van Heeringen 2000). Suicide is of course not the only cause of premature mortality. Mental disorders also carry an equivalent significant premature mortality from other causes such as infectious diseases, respiratory disease, cardiovascular disease and malignancy (Harris and Barraclough, 1998).

It has been argued that, despite the epidemiological transition occurring across the world from communicable to non-communicable diseases (Murray and Lopez, 1996), the non-communicable diseases are nonetheless suffered principally by the rich and that health efforts should still focus

primarily on communicable diseases. However, mental and neurological illnesses, besides being high prevalence and disabling, with a significant mortality, are more common in poor people than in rich people and furthermore, mental illness and mental health are relevant for the control of communicable disease.

The pace of research on mental and neurological research in rich countries is high and there has been considerable investment, particularly in biological research on aetiological factors including genes and biochemical factors, but also in research on epidemiology, disability and outcome, and on social risk factors including demographic factors, life events and social networks (Jenkins, 2001). There is also a growing body of investment in assessment of interventions and in health services and health systems research (e.g. Meltzer and Jenkins, 2003). There has been far less investment in such research in developing countries, but nonetheless a significant amount is now known about prevalence, risk factors, consequences and effectiveness of treatments in low income countries (Ustun and Sartorius, 1995; Institute of Medicine, 2001; Kessler and Ustun, 2004).

Cost effectiveness studies in relation to both specific interventions and to health service delivery have been relatively well researched in richer countries for many of these conditions, but there is little cost effectiveness research or health services research or service systems research in low income countries (Shah and Jenkins, 1999); and large numbers of individuals living in low income countries do not receive needed treatment.

Two recent reports on mental and neurological disorders in developing countries summarise the existing state of knowledge, highlight the importance of these problems and the urgent need to develop an international framework that will assist low-income countries to undertake the long-term efforts needed to resolve the problems (Institute of Medicine, 2001 and WHO 2001a).

What is the magnitude of mental and neurological disorders?

The magnitude of mental and neurological disorders may be described in terms of prevalence, disability, chronicity and mortality. Contrary to prevalent misconceptions, mental and neurological disorders are at least as common in low income

countries as established market economies (Institute of Medicine, 2001), and are not simply a problem of rich countries or indeed of rich populations in poor countries, as is sometimes erroneously argued. The prevalence of psychosis is around 0.5 to 1%, and the prevalence of common mental disorders (mostly depression and anxiety) is between 10-20% in most studies, (Institute of Medicine, 2001) with a number of studies finding substantially higher rates in relatively poor populations (eg Mirza and Jenkins, 2004). The prevalence of neurological disorders approaches 15% and may be greater (Institute of Medicine, 2001). The prevalence of substance abuse is highly culture specific, but is a growing problem everywhere. PTSD is a common problem in post conflict situations affecting a high proportion of the overall population, but researchers and donors often unfortunately focus on it to the exclusion of the overall MNH needs of the population. In general, rates of mental disorder are increased in populations subject to poverty, conflicts, displacement, high rates of HIV/AIDS. The impact of this burden is much greater in low-income countries because of the restricted services, exacerbated by lack of access, poor financing, limited availability of even the most basic treatments, and the high burden borne by the family in out of pocket expenses

The public health and economic significance of mental and neurological disorders

Mental and neurological disorders matter because of their impact on human capacity, poverty, social capital, economic productivity and the achievement of the Millennium Development Goals. Mental and neurological disorders attack the intrinsic human abilities to think, feel, communicate and they erode social and physical functioning in all areas of life. Poor people are more likely to suffer from mental health problems and neurological disorders. Poor mental health can have a severe impact on ability to earn, and therefore contributes to the poverty cycle.

The generic inequities of low- and middle-income countries are particularly relevant for MNH, including poverty, gender, age and difficulties in accessing services.

Mental illness differentially affects the poor. A recent systematic review of large-scale epidemiological studies in the West has found a consistent relationship between rates of mental illness and indicators of social disadvantage, including low income, education, unemployment, and low social status (Fryers et al., 2003). Epidemiological studies in low income countries find the same relationship. (eg Patel et al., 1999) Thus, mental disorder has implications for a number of other sectors, especially employment, education, social welfare and criminal justice. Recent epidemiological studies in Tanzania, Kenya and Burundi indicate that mental distress and mental disorder are associated with reduced social functioning, increased rates of physical disorder and increased rates of unemployment. (Baingana et al., 2003, Khandelwal et al 2005) In the Burundi study, the boy children in households with a person with mental distress were significantly less likely to go to school. Children with emotional disorders and learning disabilities are often not recognized; they are often the ones who repeat classes, drop out or perform poorly. Orphans and other vulnerable children – such as excombatants, street children, and children in child-headed households – have increased rates of mental disorder due to the risks they live with daily and the lack of social support. Their mental health needs should be addressed in any rehabilitation programme.

Mental health impacts on key international health development targets such as infant and child mortality (which will be reduced through improved treatment of postnatal depression). Reduced depression has proven links with increased compliance with important medical programmes such as antenatal care, vaccination programmes, prevention and treatment of infectious diseases, and rehydration therapy for watery diarrhoea. Treating maternal depression improves compliance with vaccination, nutrition, oral rehydration and hygiene regimes to reduce infectious diseases in children Treating maternal depression also reduces maternal mortality through decreased rates of suicide, cancer (less smoking, better nutrition) and improved physical health through better mental well-being. HIV infection rates for the 17-24 year age group are reduced because improved mental health reduces unsafe sex and levels of drug usage and addiction.

In advanced HIV, there is chronic loss of general cognitive function, leading to apathy, withdrawal and deterioration of personality. As in other major life threatening illness, AIDS has a high frequency of adjustment reaction, persistent depression, affective psychosis and suicidal risk. There is a need for more research on mental health promotion in schools to reduce risk of contracting HIV with unprotected sex or drug use, support girls to be assertive and confident in ensuring their sexuality and safety, address particular difficulties in countries where use of condoms is not widely culturally accepted by men, and to encourage abstention from drugs and harm reduction in those who use drugs

Many people with depression and anxiety present with somatic symptoms which may be misdiagnosed as physical disease such as malaria or typhoid. If not properly diagnosed and treated effectively, there is a high rate of repeat consultations and inappropriate treatments, placing an additional burden on healthcare systems.

Thus mental health and mental illness issues are so inextricably associated with delivery of physical health targets that it makes sense to address them, both in research and practice, in concert with other physical health priorities such as malaria, HIV and TB. We need a partnership rather than a competition between communicable and non-communicable diseases (WHO 2001b).

What is the scope for alleviating the burden?

There is now a considerable knowledge base for effective interventions (health promotion, prevention, treatment, rehabilitation and prevention of mortality) for many mental and neurological conditions in the developed world, and a growing number of studies in low income countries, although studies of cost effectiveness are particularly sparse. (Shah and Jenkins, 1999). However, this knowledge is not

implemented in many parts of the world for a variety of reasons including lack of mental health policy, lack of specialist services, lack of skills in primary care, lack of availability of essential medicines and treatments (WHO., 2001b; Jenkins et al., 2002).

There is also a lack of utilisation because of stigma about mental and neurological disorders – frequently even more prevalent in developing countries than in the west.

Research architecture

There is a substantial funding gap partly because of stigma about these conditions, partly because neurologists and psychiatrists lack access to funders and decision makers allocating resources, partly because there is a severe brain drain problem of psychiatrists, neurologists and specialist nurses to the west (Ndetei, 2004).

Most of the research funding organisations do not have specific initiatives or programmes to fund research on MNH. There is also a lack of identified career pathways for researchers in low-income countries, which makes them highly vulnerable to being poached by the west.

Many basic training courses for psychiatric nurses, psychiatrists and neurologists include a research component and production of a research thesis, but this early exposure to research methodology and skills is then not utilised in the person's subsequent clinical career. These early research theses are rarely published and thus inaccessible to others, although scrutiny shows that they frequently address important local issues.

Unfortunately there is a lack of attention to mechanisms whereby people can pursue research as an integral part of their clinical careers so that research activity does not inadvertently cause damage to fragile healthcare systems by further reducing the availability of well-informed clinical leadership.

The lack of ready access to standardised assessment tools, and a lack of access to skills in their use is a major barrier for researchers in the developing world. In addition, there is a need to continue to develop, validate and adapt instruments which are sensitive to local cultural and idiomatic expressions of distress, which might otherwise be missed by western instruments.

Selection of research priorities

There is often a disparity between the research priorities of governments, funding institutions and academics. There is a need to develop systems to ensure that the views of relevant stakeholders are taken into account. The Global Forum for Health Research has recently funded a project to support the development of grassroots MNH research prioritisation in the different regions of the world, and this will report next year (Khandelwal et al., 2005).

Dissemination and application of research

Results all too frequently are not applied. There are wide gaps between research, policy and action. Sometimes this is because the research was not designed with either the logistical constraints of the country nor with the overall framework and direction of the health and social sector reform

processes in mind; and there is a need for further practice based operational health services research, evaluation, fiscal impact analysis and socio economic impact analyses, costs and cost-effectiveness research to influence policy and to demonstrate how the findings can be used within the local context. There, therefore, needs to be closer developmental partnerships between policy makers, donors and researchers if researchers wish their studies to contribute to the policy process. Also, a further helpful mechanism is to organise appropriate MNH contributions to the annual meetings of public health officials, general medical and nursing conferences, and regional and district management teams, etc.

Reseach funding

For MNH research, some funding is available from rich country donors, and medical research councils in some middle income countries now have dedicated some funding for MNH research, although little is yet available for the type of practice based research which assists real implementation in the field. However, few low-income countries yet have indigenous MNH research funding. This means that it is crucial to develop partnerships between countries, particularly South-South, as well as North-South, and to develop mechanisms for maximising the research potential of all health professionals in training. It is also crucial to maximize the potential of newly developing and existing health information systems in primary and secondary care to gather useful data, and to ensure that sentinel surveillance sites and other generic health research projects address MNH issues.

In conclusion, mental and neurological disorders are common, and are associated with poverty and income disparity. Whereas effective prevention, treatment and rehabilitation interventions exist to reduce a substantial part of this burden, there is a lack of awareness about such evidence and a lack of research to demonstrate how these findings can be implemented within resource constraints of poor countries – hence there are enormous treatment gaps. Knowing the burden of mental and neurological disorders, it is unethical to allow the disparity to continue.

Inter-disciplinary research combined with partnership with implementing agencies is needed to overcome the barriers to care for persons with mental and neurological disorders in poor countries and to effectively change unhealthy behaviours in high-risk groups in these countries. There is a critical lack of research capacity in low-income countries in these fields and barriers to the translation of research results into action.

Rachel Jenkins is Director of the WHO Collaborating Centre and Head of the Section of Mental Health Policy at the Institute of Psychiatry, London. She works mainly in low and middle-income countries on research, mental health policy development and implementation.

Donald Silberberg, Professor of Neurology, University of Pennsylvania, has worked on behalf of those with brain disorders in developing countries through the Global Forum for Health Research, WHO, the World Bank, the World Federation of Neurology, and as the founding Vice-President of the Global Network for Research on

Mental and Neurological Health. He initiated the 2001 Institute of Medicine report, Neurological, Psychiatric and Developmental Disorders – Meeting the Challenge in the Developing World.

Florence Baingana, a Ugandan Psychiatrist, has been working for the World Bank as Senior Mental Health Specialist since March 2000, providing technical assistance in analytic work, knowledge dissemination, and operational activities, with the aim of integrating mental and neurological disorders components into Bank lending programmes. Before joining the Bank, she was National Mental Health Coordinator in the Ministry of Health of Uganda.

References

Abdulahi, H, Mariam, DH, Kebede, D, 2001. 'Burden of disease analysis in rural Ethiopia'. *Ethiop Med J.* 39:271-81.

Bergen, D, and Silberberg, D, 2002. 'Nervous system disorders: A global epidemic'. *Archives of Neurology* 59, 1194-6.

Fryers, T, Melzer, D, Shah, A, and Jenkins, R, 2003. *Inequalities in mental health*. Maudsley Monograph, London

Harris, EC, and Barraclough, B, 1998. 'Excess mortality of mental disorder' *British Journal of Psychiatry*. 173,11-53

Hawton, K, and van Heeringen, K, 2000. The International Handbook of Suicide and Attempted Suicide. Wiley, Chichester

Institute of Medicine, 2001. Neurological, Psychiatric and developmental Disorders. Meeting the Challenge in the Developing world. National Academy Press, Washington DC.

Jenkins, R, 2001. 'Making psychiatric epidemiology useful: The contribution of epidemiology to mental health policy'. *Acta Psych Scand*, 103, 2-14

Jenkins, R, McCulloch, A, Friedli, L, Parker, C, 2002. *Developing a national mental health policy*. Maudsley Monograph 43, Psychology Press, Taylor and Francis Group.

Baingana, F, Jenkins, R, Gulbinat, W, Khandelwval, S, Manderscheid, R, Mayeya, J, Minoletti, A, Mubbashar, M, Murthy, S, Parmeshvara, D, Schilder, K, Tomov, T, and Whiteford, H, 2003. *International Review of Psychiatry*, Vol 16 Nos 1-2. International Project on mental health policy and services. Phase 1:Instruments and country profiles. www.mental-neurological-health.net,

Kessler, R, and Ustun, T, 2004. 'Prevalence, Severity, and Unmet Need for Treatment of Mental Disorders in The World Health Organization World Mental Health Surveys', *JAMA*. 291:2581-2590

Khandelwal, S, Mubbashar, M, Gulbinat, W, Jenkins, R, Baingana, F, Silberberg, D, Cruz, M, Mayeya, J, Conde, B, Toma, T, Mandersheid, R, 2005. Research Priorities for mental and neurological disorders in developing countries-report of a series of regional workshops. In preparation.

Melzer, H, and Jenkins, R, 2003. The British Psychiatric Morbidity Survey Programme 1993-2003 *International Review of Psychiatry*, 15, No 1 and 2. Mirza, I, and Jenkins, R, 2004. 'Risk factors, prevalence, and treatment of

anxiety and depressive disorders in Pakistan: systematic review'. *British Medical Journal* 328: 794 - 0

Moshiro, C, Mswiia, R, Alberti, KGGM, Whiting, DR, Unwin, N, Setel, P, 2001. 'The importance of injury as a cause of death in sub-Saharan Africa: results of a community based study in Tanzania'. *Public Health* 115, 96-102

Murray, C, and Lopez, AD, 1996. The Global Burden of disease - A comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Harvard University Press, Boston.

Ndetei, D, 2004. Recruitment of Consultant Psychiatrists from Low and Middle Income Countries (Draft, 2004). Cited in: Friedman, EA, 2004. An Action Plan To Prevent Brain Drain: Building Equitable Health Systems in Africa. Physicians for Human Rights, Boston.

Patel, V, Araya, R, de Lima, M,. Ludermir, A, and Todd, C, 1999. 'Women, poverty and common mental disorders in four restructuring societies'. Social Science and Medicine, Vol. 49(11): 1461-1471

Shah, A, and Jenkins, R, 1999. 'Mental health economic studies from developing countries reviewed in the context of those from developed countries'. *Acta Psychiatrica Scandinavica*. 100:1-18

Ustun, TB, and Sartorius, N, 1995. Mental Illness in General Health Care - An international study, Wiley & Sons, Chichester.

WHO, 2001a. The World Health Report 2001. Mental Health: New Understanding, New Hope. World Health Organisation, Geneva.

WHO, 2001b. WHO Atlas of Mental Health resources in the World. World Health Organisation, Geneva (http://www.mh-atlas.ic.gc.ca/). http://www.who.int

WHO, 2002. The World Health Report 2002: Reducing Risks – Promoting Healthy Life, World Health Organization, Geneva.

WHO Collaborating Centre, 2004. WHO Guide to Mental Health in Primary Care (adapted for the UK from Diagnostic and Management Guidelines for Mental Disorders in Primary Care. Chapter V, Primary Care Version. Royal Society of Medicine, London.

Health research for sexual and reproductive health

Article by Paul F A Van Look and Catherine d'Arcangues

he Millennium Development Goals, developed as a result of the Millennium Declaration agreed to by 189 countries in 2000, provide the new international framework for measuring progress towards sustaining development and eliminating poverty (United Nations, 2000). Of the eight Goals, three – concerning maternal health, child health and reducing HIV/AIDS – are directly related to sexual and reproductive health and rights, and their set targets are to:

- reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio;
- reduce by two-thirds, between 1990 and 2015, the under-five mortality rate;
- have halted by 2015, and begun to reverse, the spread of HIV/AIDS.

Four other Millennium Development Goals – concerning poverty eradication, gender equality and empowerment of women, universal primary education and environmental sustainability – have a close relationship with health, including sexual and reproductive health.

Maternal health is central to reproductive health and reducing maternal mortality below its current level of more than half a million deaths a year (or about one death every minute) (World Health Organization, 2004a) remains a formidable challenge. In addition, pregnancy and childbirth cause several million cases of long-term maternal morbidities. Progress has been achieved in reducing overall under-five mortality in recent years, but neonatal mortality has not significantly improved (United Nations Children's Fund. 2002). Three million newborn die during the first seven days of life and an estimated 2.7 million stillbirths occur; many of these deaths are related to the poor health of the mother and to inadequate care during pregnancy, childbirth and the postpartum period. Most of the cases of maternal and neonatal deaths occur in developing countries, particularly where health systems are weak and understaffed, and individuals and their families not sufficiently aware of the risks inherent to childbirth.

Need for hard evidence

Maternal health services need to be grounded on solid evidence so that only effective interventions, and among those the most cost-effective ones, are promoted in order to

optimise the use of resources and reach the greatest number of those in need of care. Several examples illustrate the unique contribution of research to the improvement of maternal health care. A number of antenatal care regimens are used throughout the world, some are woefully inadequate while others are wasteful of resources. A review of the evidence supporting each of the interventions of antenatal care was conducted and a new model was created, rationalising the timing and the frequency of the interventions that were proven beneficial. This led to the definition of the WHO antenatal care model based on four visits optimally timed over the pregnancy (World Health Organization, 2002). In a multi-country study, it was found to be as effective and more cost-effective than more resourced models. It is now being deployed worldwide, starting with introduction in 16 countries. The MAGPIE trial is another example of international collaborative research which provided research results with sufficient power to establish the effectiveness of magnesium sulfate for the treatment of pre-eclampsia. thereby providing solid foundation for a life-saving intervention (World Health Organization, 2004b).

Strengthening health systems

Reductions of maternal mortality and morbidity also need major efforts in strengthening of health systems including human resource management, sustainable financing that facilitates access by the poor, quality improvement of services, and integration of programmes such as those for nutrition, immunisation, malaria, HIV/AIDS and others. Progress in all of these areas requires the support of operations research, particularly when the time comes to scale up successful local initiatives. Women's education and empowerment are also essential components of progress.

But even where services are available and effective, research-based evidence is needed in a number of key areas (Bale, Stoll and Lucas, 2003). For instance, there is little understanding of the etiology of some major maternal and newborn conditions, in particular pre-eclampsia and eclampsia, premature rupture of membranes and pre-term delivery. Also, the causes of other conditions such as intrauterine growth retardation, postpartum haemorrhage or miscarriage are only partly elucidated. These entities are heterogeneous and multi-factorial, but only when research will have advanced understanding of their underlying

mechanisms, will their primary prevention and effective treatment become possible.

Contraception and family planning

Fertility regulation is one intervention that effectively reduces maternal and newborn mortality and morbidity by allowing appropriate spacing or limiting of births. This area has benefited from much research over the last 40 years. Contraceptive use in many developing countries has substantially increased and in some countries is approaching levels of developed countries where prevalence of use among women in union is close to 70% (United Nations Population Division, 2003). Yet surveys indicate that, in developing countries and countries in transition, more than 120 million couples (married or in stable union) are still not using any contraception despite their expressed desire to avoid or to space future pregnancies. Other data suggest that an unmet need is also prevalent among unmarried sexually active adolescents and adults. Lack of information, opposition on cultural and religious grounds, and lack of access are some of the reasons for this non-use. But even among the more than 600 million family planning users, about half abandon their method by one year of use and up to 27 million of them experience an unintended pregnancy each year because of method or user failure. There is a need to increase the choice of methods - as well as their intrinsic effectiveness and ease of use - to meet the varying needs of individuals.

An example of the contribution made by research in this area is the recent developments in emergency contraception (Van Look, PFA, 1998). While this type of contraception has been available for over 30 years, it was called the best-guarded secret of family planning. It was little known and thus underused, and little researched. Now, our Programme has developed a new levonorgestrel-based method which is more effective, has less side-effects and is easier to use than

An example of the contribution made by research in this area is the recent developments in emergency contraception (Van Look, PFA, 1998). While this type of contraception has been available for over 30 years, it was called the best-guarded secret of family planning

the original Yuzpe regimen (named after its original inventor, the Canadian gynaecologist Albert Yuzpe). This new approach has been registered for marketing in more than 90 countries worldwide and it is estimated, for example, that in 2000 in the USA alone, 51,000 abortions were averted as a result of emergency contraception use.

But more needs to be done. There is a need to develop reversible methods for men, methods that protect against both pregnancy and sexually-transmitted infections and long-acting methods that are under the user's control. Special attention should be paid to developing methods that have low typical-use failure rates (i.e. are more 'forgiving' of user mistakes) and those that have non-contraceptive health benefits, such as the reduction in endometrial and ovarian

cancer seen in oral contraceptive users and the improvement of anaemia in users of a levonorgestrel-releasing intra-uterine device. Greater understanding is needed of the mechanisms responsible for the side-effects of existing methods, for example those underlying endometrial bleeding induced by hormonal contraception, and there is also a need for the identification of new, more specific targets for contraception that will avoid the systemic effects of current hormonal methods.

Healthy individuals need to use contraception over several decades of their lives, thus first priority in much of the past research was given to establishing the long-term safety of contraceptive methods among healthy individuals. But little is known about the safety and risk-benefit ratio of these methods - hormonal methods in particular - among women with chronic diseases, such as diabetes mellitus or cardiovascular diseases, whose health is put at greater risk by a pregnancy. Also, acceptability studies are providing the basis for understanding individual choices with regard to family planning, and attitudes towards risk-taking in terms of pregnancy and sexually-transmitted infections, but research is urgently needed to examine how this understanding can be translated into effective dual protection messages and programmes. New challenges, such as the HIV epidemic, also call for attention to new issues. The majority of HIVpositive individuals are in their reproductive years and in need of contraception. Research is needed to clarify whether and how contraception - hormonal and intra-uterine methods in particular - affects the course of their disease, modifies their infectivity, and interacts with their antiretroviral therapy. Data are also needed to confirm or otherwise that different methods of contraception do not increase the risk of HIV acquisition among women who are HIV-negative.

Infertility research

Family planning is about giving people the means to have the number of children they want, when they want to have them. It thus also includes infertility - a condition that affects some 60-80 million couples around the world, most of them living in developing countries. Among men the commonest causes of infertility are abnormalities (themselves usually of unknown origin) in the number and motility of their sperm, whereas in women tubal damage, usually as a result of previous genital tract infection, is commonplace. At times, no cause can be found and the infertility is then referred to as being idiopathic. In developed countries, many infertile couples can now become parents through the use of assisted reproductive technologies, but these treatments are inaccessible to the majority of infertile couples in the developing countries. Given the social stigma often associated with infertility in the developing countries, there is an urgent need for effective, low-cost assisted reproductive technologies that can be used in resource-constrained settings. At the same time, further research is required to elucidate the causes of infertility - idiopathic infertility in particular - so that prevention and treatment can be made more effective.

Sexually-transmitted disease

An estimated 340 million new cases of largely treatable sexually transmitted bacterial infections occur annually (World Health Organization, 2001). Many are untreated because they are difficult to diagnose and because of a lack of competent, affordable services. Research is needed on simple, rapid and cheap diagnostic tools, simplified treatments and effective responses to antimicrobial resistance. In addition, millions of cases of mostly incurable viral infections occur annually, including five million new HIV infections of which 600,000 are in infants due to mother-tochild transmission (Joint United Nations Programme on HIV/AIDS, 2004). Cure is still out of reach for virtually all viral infections and more effective treatments are needed alongside the development of vaccines. In the meantime, emphasis on prevention needs to be sustained and women need to be empowered with methods of protection that are under their control, such as microbicides and new female condoms.

The linkages between sexual and reproductive ill-health and HIV/AIDS are many and have important and wideranging implications for programmes dealing with these two conditions. The overwhelming majority of HIV infections are sexually transmitted or, in the case of mother-to-child transmission (MTCT) of HIV, associated with pregnancy, childbirth and breastfeeding. Also, sexual and reproductive illhealth and HIV/AIDS are driven by many common root causes, including gender inequality, poverty and social marginalisation of the most vulnerable populations. Thus, there is a logical and urgent rationale to ensure that both sexual and reproductive health initiatives and HIV/AIDS initiatives are mutually reinforcing and that strategies are developed that create synergisms and result in more relevant and cost-effective integrated programmes. Both 'The Glion Call to Action' (UNFPA, 2004a) and 'The New York Call to Commitment' (UNFPA, 2004b) have recently stressed the necessity of strong linkages between these two programme areas but experience to date of how this can best be achieved is limited, highlighting the need for a major research effort, particularly operational research into health systems and services.

A key topic at the interface between reproductive health and HIV concerns the prevention of MTCT of HIV, as well as of other sexually transmitted infections including syphilis and herpes simplex virus 2 (HSV2). Considerable progress has been made to reduce the risk of HIV transmission in resourcelimited settings, but the overall rates remain considerably higher than the 1-2% reported for developed countries. Now that antiretroviral therapy is becoming more affordable and accessible in developing countries, the prevention of MTCT of HIV in resource-limited settings is opening up a whole new agenda of research ranging from the reasons underlying the uptake, or non-uptake, of voluntary counselling and testing. to the most effective drug regimens for preventing MTCT of HIV and risk of developing viral drug resistance, to the choice of infant feeding option and the continued use of antiretroviral drugs during breastfeeding if that is the chosen option, not to mention the many operational issues relating to the safe and efficient delivery of antiretroviral drugs, the follow-up of HIV-

infected women and their infants, and the functional linkage between programmes for prevention of MTCT of HIV and programmes for the treatment of the HIV-infected woman and her family, including the infant if MTCT prevention of the virus was not successful.

The sexually transmitted human papillomavirus infection is closely associated with cervical cancer, which is diagnosed in more than 490,000 women and causes 239,000 deaths every year (Joint United Nations Programme on HIV/AIDS, 2004). Three-quarters of all cervical cancer cases occur in developing countries where tools and treatment are seriously lacking. Programmes need rapid, more specific and sensitive screening methods and simple, minimally invasive procedures to detect and treat early cervical abnormalities.

Each year, an estimated 210 million women throughout the world become pregnant and some 20-25% of them resort to termination of the pregnancy. It is estimated that 40-45 million abortions are performed annually; 19 million of these abortions are estimated to be unsafe abortions (Åhman and Shah, 2002), that is, they are done by persons lacking the necessary skills or in an environment lacking the minimal medical standards, or both (World Health Organization, 1992). In contexts where access to safe abortion is restricted, abortion-related mortality is high. For example, some 680 women die per 100,000 abortions in Africa (where abortion laws are generally restrictive) compared to less than one in developed regions (where more liberal abortion laws are the norm). Globally, it has been estimated that some 70,000 women die each year as a consequence of unsafe abortion; to this number needs to be added a further five million who suffer temporary or permanent disability. The reduction and elimination of unsafe abortion is a key strategy in the reduction of maternal mortality and therefore in achieving Millennium Development Goal 5 on improving maternal health.

The procedures that allow safe termination of early pregnancy are well-established (United Nations Population 2004), although the newer, non-surgical (pharmacological) approaches that involve the use of antiprogestogens (progesterone receptor blockers) such as mifepristone, in combination with a prostaglandin analogue such as misoprostol, could benefit from further studies. particularly to refine and simplify the treatment regimen, reduce the incidence of side-effects such as abdominal pain. and shorten the duration of post-abortion bleeding. Research is also under way to assess the safety and efficacy of misoprostol alone for early abortion given the wide availability of this compound (in contrast to the limited market presence of mifepristone). As important as the above biomedical and epidemiological studies, however, are the socio-behavioural enquiries into the reasons why unintended pregnancies occur and how, and with whose involvement, decisions are made about the termination of such pregnancies. Only through a better understanding of these issues based on formative social science research will we be able to design successful programmes to help people avoid unintended pregnancies and provide effective post-abortion care.

Making sexual and reproductive health services accessible

In follow-up to the main goal of the Programme of Action of the International Conference on Population and Development (ICPD, Cairo, 1994) on making sexual and reproductive health services accessible to all couples and individuals, policy-makers and programme managers in most countries undertook with enthusiasm the efforts needed to enhance the internalisation of the concept of sexual and reproductive health. They endeavoured to develop new policies and programmes that are responsive to the constantly changing needs of people across their life span and that tried to integrate as much as feasible different elements of sexual and reproductive health. To the extent possible, this 'paradigm shift' took due account of the diversity of cultural, religious and economic factors that affect sexual and reproductive health behaviours and gender relationships.

Consequently, there are many examples of developing countries that made remarkable progress toward the operationalisation of the core elements of sexual and reproductive health and the development of relevant programmes as called for in the ICPD Programme of Action. However, as recent programme reviews have shown (United Nations Population Fund, 2004), several concerns need to be addressed; in many instances this will require research at several levels, at policy level, at the supply level of health systems and health services (including quality of the services offered), and at the demand level of the end-users (including their needs, priorities and perspectives).

Examples of areas of concern that call for systematic enquiry include:

- how to effectively integrate services, for instance those providing family planning with STI/HIV prevention and control services;
- how to assess and improve the quality of services and replicate (scale up) successful interventions;
- how best to train, supervise, deploy and reward healthcare workers;
- how to ensure that programmes and services do not reinforce existing inequities and reach the poor and other

vulnerable groups such as adolescents, refugees and internally displaced persons.

At the macro-level, key questions are:

- the impact of market-led health sector reforms and other structural or organisational changes (for instance, decentralisation of the regulatory role of the government or new financing and resource allocation mechanisms) on the quality of services and on equity in access and health outcomes:
- the effect of sector-wide approaches on the place and prominence of sexual and reproductive health in national planning and budgeting; and the relationship between investments made in sexual and reproductive health programmes and poverty alleviation.

The research needs in sexual and reproductive health and rights are vast, requiring the contribution of a wide range of disciplines. Indeed, in each of the areas mentioned, cost-effectiveness and acceptability studies of interventions are needed to ensure that research can benefit the greatest number of individuals. Finally, for optimal impact, the evidence generated by research requires rapid translation into practice and this challenge itself should be the focus of research in order to reduce the time to implementation and enjoyment by those whose lives will be improved (UNDP/UNFPA/WHO/World Bank 2004).

Paul Van Look is Director of the Department of Reproductive Health and Research at the World Health Organization. He holds a medical degree from the University of Ghent (Belgium), a PhD in reproductive endocrinology from the University of Edinburgh (Scotland), is a qualified obstetrician/gynaecologist and is a Fellow ad eundem of the Royal College of Obstetricians and Gynaecologists (UK).

Catherine d'Arcangues obtained a PhD in Biological Sciences from Paris University before becoming a Board-certified specialist in Internal Medicine and a Fellow in Endocrinology in the United States. She is now Coordinator in the Department of Reproductive Health and Research of the World Health Organization.

References

Åhman E, Shah I. 'Unsafe abortion, 2002'. Reproductive health matters 10(19):13-17

Bale JR, Stoll BJ, Lucas AO (eds), 2003. Improving birth outcomes. Meeting the challenge in the developing world. Washington, D.C., The National Academies Press.

Joint United Nations Programme on HIV/AIDS, 2004. 2004 Report on the global AIDS epidemic. Geneva, UNAIDS. http://www.unaids.org/ bangkok2004/report.html (accessed 1 August 2004)

UNFPA, 2004a. The Glion Call to Action on family planning and HIV/AIDS in women and children, 3-5 May 2004. http://www.unfpa.org/upload lib pub file/299 filename_Glion%20Call%20to%20Action.doc. (accessed 1 August 2004).

UNFPA, 2004b. The New York Call to Commitment: Linking HIV/AIDS and sexual and reproductive health. Statement released at XV International AIDS Conference, Bangkok, 11-16 July 2004. www.unfpa.org/icpd/10 /docs/ hiv aids rh call commitment.doc (accessed 1 August 2004).

United Nations, 2000. UN Millennium Development Goals. http://www.un.org/millenniumgoals/ (accessed 1 August 2004).

United Nations Children's Fund. 2002. Building a world fit for children. The United Nations General Assembly Special Session on Children, 8-10 May 2002. New York. United Nations Children's Fund (UNICEF). http://www.unicef.org/publications/index_7932.html (accessed 1 August

UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction, 2004. Improving sexual and reproductive health through research: an investment for the future. Geneva, World Health Organization.

United Nations Population Division, 2003. World contraceptive use 2003 (wallchart). http://www.un.org/esa/population/publications/contraceptive2003 /WCU2003.htm (accessed 1 August 2004).

United Nations Population Fund, 2004. Investing in people. National progress in implementing the ICPD Programme of Action 1994-2004. New York, United Nations Population Fund, 2004. http://www.unfpa.org/publications/index.cfm?ID=179 (accessed 1 August

Van Look, PFA, 1998, Emergency contraception; no longer the nation's best kept secret. In: Kempers RD, Cohen J, Haney AF, Younger JB (eds.) Fertility and reproductive medicine. Amsterdam, Elsevier, 1998, pp 317-

World Health Organization, 1992. The prevention and management of unsafe abortion. Report of a Technical Working Group, Geneva, April 1992 (document WHO/MSM92.5).

World Health Organization, 2001. Global prevalence and incidence of selected curable sexually transmitted infections. Overview and estimates. Geneva, World Health Organization.

World Health Organization, 2002. WHO Programme to Map Best Reproductive Health Practices. Antenatal care: from research to action. Geneva, World Health Organization.

World Health Organization, 2004a. Maternal mortality in 2002: estimates developed by WHO, UNICEF and UNFPA. Geneva, World Health Organization. http://wwwstage/reproductive-health/publications/ maternal mortality 2000/index.html (accessed 1 August 2004)

World Health Organization, 2004b. The WHO Reproductive Health Library No.7. Geneva, World Health Organization.

Sexual violence



Article by Claudia Garcia-Moreno (pictured) and Chen Reis

Sexual violence is both a public health problem and a violation of human rights, but it has been difficult to have it recognised as a legitimate health issue. Sexual violence has received little attention from donors, researchers, policy makers and programme designers, until recently. What is known about violence against women, including sexual violence, suggests that addressing it is essential to achieving the targets of the Millennium Development Goals (MDGs) (UN, 2001). This article summarises what is known about sexual violence, highlights the gaps in knowledge and suggests what is required for addressing sexual violence.

Types of sexual violence

Sexual violence encompasses a wide range of acts, including forced/coerced sex in marriage and dating relationships, rape by strangers, sexual harassment (including demands for sexual favours in return for jobs or school grades), sexual abuse of children, and forced prostitution and sexual trafficking (Jewkes, Sen and Garcia-Moreno, 2002). These forms of violence are common worldwide. Other forms of sexual violence such as child marriage and acts against the bodily and sexual integrity of women including female genital cutting or mutilation and obligatory inspections for virginity are common in some regions.

Rape and sexual abuse are also increasingly recognised as being highly prevalent in situations of armed conflict (Swiss and Gilles, 1993), most recently in Sudan (Amnesty International, 2004), Liberia (Human Rights Watch, 2004), Sierra Leone (Physicians for Human Rights, 1999), Kosovo (UNFPA, 2000), and the Democratic Republic of Congo (Human Rights Watch, 2002), and among refugee and internally displaced populations (Hynes and Lopes Cardozo, 2000). While sexual violence may be experienced by women, men, girls and boys, sexual violence most often affects women and girls.

Health consequences

Sexual violence is an important risk factor for a range of mental and physical health consequences, both at the time of the abuse and for years to come. Sexual violence can be linked with homicide and injury. More frequently, it is associated with a range of sexual and reproductive health problems, including unwanted pregnancy, and, related to

this, unsafe abortion (Jewkes, Sen and Garcia-Moreno, 2002). A study in the United States found that assuming a 5% pregnancy rate per rape there would be over 32,000 pregnancies related to rape nationally each year (Holmes, et al., 1996). Reports from rape crisis centres in Mexico record 15–18% of those reporting rape becoming pregnant as a result (Asociación Mexicana contra la Violencia a las Mujeres, 1990). Although most countries do allow for legal provision of abortion services in cases of rape, these services are often not available or are associated with stigma, leading to unsafe abortions or unwanted children. Sexual violence also increases the risk of sexually transmitted infections (STIs), including HIV/AIDS, and gynaecological problems such as chronic pelvic pain, genital injuries, or pelvic fistulae (Jewkes, Sen and Garcia-Moreno, 2002).

Sexual violence is also associated with a range of mental health problems, including depression, substance abuse, anxiety and eating disorders and post traumatic stress disorder (Campbell, 2002). Ultimately sexual violence can lead to death from suicide. In a study in New Zealand, psychiatric symptoms were found in 33% of women with a history of sexual abuse as adults, compared to 15% of women with a history of physical abuse and 6% of non-abused women (Mullen et al., 1988). Sexual abuse during childhood has been associated with later victimisation and high-risk behaviour for STIs such as early sex, multiple partners and alcohol and drug use (Zierler et al., 1991).

Risk factors for sexual abuse

Data on the risk factors for sexual abuse are limited, but like other forms of abuse it involves complex interactions between factors at individual, family, community and societal levels. Factors that have been found to increase women's vulnerability to sexual violence include the following: being young, consuming alcohol or drugs, having been abused sexually before, involvement in sex work, having a high number of sexual partners and poverty (Jewkes, Sen and Garcia-Moreno, 2002).

Gaps in knowledge

There are little reliable data, particularly from lower- and middle-income countries, on the magnitude and nature of sexual violence, its health impacts, and its risk factors. There is also a need for evaluations of existing interventions and their effectiveness.

Barriers to addressing sexual violence

Barriers to addressing sexual violence are often societal, political and financial. The silence and stigma attached to sexual violence likely contributes, as other issues receive more attention and are prioritised by donors, policymakers, and programme planners. Sexual violence remains a taboo issue in many societies. Women, men and children who have experienced sexual abuse do not find it easy to disclose this due to shame, fear of not being believed and the very real risk of being stigmatised, rejected or even blamed. The perceptions or beliefs of those who are in positions to address sexual violence at the policy level often affect whether and how sexual violence is addressed. The absence of data on the nature and magnitude sexual violence is also a barrier to obtaining funding and targeting effective interventions, especially in lower and middle income countries. Where there are limited resources available and many competing issues, sexual violence often falls by the wayside because it is seen as a 'personal' or 'family' issue or because it is perceived as an unfortunate but complex issue which the system lacks capacity to address.

As responses to sexual violence must involve several sectors including the health and justice sectors, coordination of efforts is essential. Where coordination is lacking, this erects a further barrier to an effective response.

The response or lack of it to sexual violence in recent and ongoing conflicts is an illustration of the challenges mentioned above. While the use of sexual violence as a weapon in conflicts has recently received increased attention in international media and has been acknowledged as a crime against humanity in international law (International Criminal Court, 2002), little is done on the ground to prevent this from happening and to address its physical, psychological and social consequences. Interventions to address other health issues in these crisis settings are prioritised because more is known about the issues they seek to address and the effectiveness of the interventions and health providers are better equipped to deal with them. The lack of coordination between the different sectors, essential to addressing this problem, and the perceptions of policy-makers about the nature of sexual violence further limit the response.

What is needed

To respond effectively to the problem of sexual violence there is a need for political commitment, for coordinated efforts within and between countries and regions, and for reliable data on both magnitude and nature of the problem and on effective interventions, particularly from low and middle income countries.

Political commitment requires recognition of sexual violence in all its forms as a public health issue rather than a private or family matter. The remarkable commitments made by the international community to achieving the Millennium goals and advances made towards them by countries demonstrate the power of political will to address tough and

complex issues. Addressing violence against women, including sexual violence, must be recognised as a key part of achieving all of the MDGs, but in particular MDGs 3,5 and 6 on gender equality, maternal health and HIV/AIDS (UN, 2001).

Internationally and regionally, addressing sexual violence such as trafficking and sexual violence in conflict and internal displacement or refugee settings requires commitment for action backed up by law reform and enforcement. Commitment of funds and other resources are also needed for prevention of sexual violence and for provision of services to survivors of it.

At the country level, the various sectors involved in responding to sexual violence must work together to ensure an effective survivor-friendly response. The health sector has a role to play in providing quality comprehensive care for people who have been sexually assaulted (World Health Organization, 2004). This should include, for example, the provision of emergency contraception, treatment for sexually transmitted infections (STIs), and referral for counselling and other psychosocial support required in the long term. In many countries, the health sector is also responsible for documentation and gathering of evidence which requires coordination with the justice sector (encompassing the police and the courts).

Similarly, the justice sector should coordinate with the health sector to ensure that evidence is collected with minimal risk of re-traumatisation of the survivor and that cost and distance do not prevent the collection of evidence or present a hardship to the survivor. The collection of evidence must also be linked to standards of proof for the crime alleged and the physical and psychological well-being of the survivor must be a priority. While the need for coordination appears self-evident, it rarely occurs sufficiently. Coordination must also involve other stakeholders such as non-governmental and community based organisations. Ultimately, prevention of sexual abuse is the key, and this requires involvement of an even broader coalition of actors such as the media, education and communities.

The absence of reliable data is a significant barrier to addressing sexual violence. Data are essential to estimating the burden of sexual violence and to understanding why it persists and how it can be prevented. They may be crucial for obtaining sufficient resources for interventions and can inform interventions and strengthen efforts by activists and policy makers to prevent sexual violence and to address its consequences.

The Sexual violence research initiative (SVRI)

The Sexual Violence Research Initiative (SVRI) of the Global Forum for Health Research was founded to address the knowledge gaps around sexual violence. The goals of the SVRI are to improve knowledge and understanding of sexual violence internationally, build capacity in sexual violence research and strengthen its support base especially in lower and middle income countries, increase awareness of sexual violence as a public health problem,

and create a network of experienced and committed researchers, policy makers, activists and donors who will work together to ensure that the many aspects of sexual violence are addressed.

For more information about the SVRI see http://www.who.int/ gender/en/.

Claudia Gracia-Moreno is coordinator in the Department of Gender and Women's Health of the World Health Organization. She has extensive international experience in public health, primary

healthcare, and women's health. She is the coordinator of the WHO Multi-Country Study on Women's Health and Domestic Violence and a co-author in the World Report on Violence and Health. She chairs the Coordinating Group of the Sexual Violence Research Initiative.

Chen Reis is programme officer for the Sexual Violence Research Initiative of the Global Forum for Health Research, which is currently hosted by the Department of Gender and Women's Health of the WHO. She has extensive experience in the field of international health and human rights law and policy, with a focus on health and human rights issues relating to women and children.

References

Amnesty International, 2004. 'Darfur: Rape as a weapon of war: sexual violence and its consequences. AFR 54/076/2004, 19 July 2004.

Asociación Mexicana contra la Violencia a las Mujeres, 1990. Evaluación de proyecto para educación, capacitación y atención a mujeres y menores de edad en materia de violencia sexual, enero a diciembre 1990. [An evaluation of a project to provide education, training and care for women and minors affected by sexual violence. January-December 1990.] Asociación Mexicana contra la Violencia a las Mujeres, Mexico City.

Campbell, JC, 2002. 'Health consequences of intimate partner violence' Lancet 359:1331-1336.

Holmes, MM, et al. 1996. Rape-related pregnancy: estimates and descriptive characteristics from a national sample of women. American Journal of Obstetrics and Gynecology 175:320-324

Human Rights Watch, 2002. The War Within the War: Sexual Violence Against Women and Girls in Eastern Congo. Human Rights Watch, available at: http://www.hrw.org/

Human Rights Watch, 2004. The Guns are in the Bushes: Continuing Abuses in Liberia. Human Rights Watch, available at: http://www.hrw.org/

Hynes, M, and Lopes Cardozo, B, 2000. 'Sexual violence against refugee women'. Journal of Women's Health and Gender-based Medicine 9(8): 819-823.

International Criminal Court, 2002, Kunarac and Kovac (IT-96-23) "Foca", and Vukovic (IYT-96-23/1), Prosecutor v. Jean-Paul Akayesu, Judgment, No. ICTR-96-4-T (Sept. 2, 1998), and Rome Statute of the International Criminal Court 2187 U.N.T.S. 3, entered into force July 1, 2002

Jewkes, R, Sen, P, and Garcia-Moreno, C, 2002. Sexual Violence. In: World Report on Violence and Health. World Health Organization, Geneva.

Mullen, PE, et al. 1988. 'Impact of sexual and physical abuse on women's mental health'. Lancet i:841-845.

Physicians for Human Rights, 1999. War-Related Sexual Violence in Sierra Leone: A Population-Based Assessment, 2002. Human Rights Watch, Sierra Leone: Getting Away with Murder, Mutilation, Rape. Human Rights Watch, available at: http://www.hrw.org/

Swiss, S, Gilles, JE, 1993. Rape as a crime of war: a medical perspective. Journal of the American Medical Association 270:612-615.

UN, 2001. General Assembly Resolution 55/2. United Nations Millennium Declaration; see http://www.un.org/millenniumgoals/

UNFPA, 2000. Assessment Report on Sexual Violence in Kosovo, 1999. Human Rights Watch, Kosovo: Rape as a Weapon of 'Ethnic Cleansing'. Human Rights Watch, available at: http://www.hrw.org/

World Health Organization, 2004. WHO Guidelines for Medico-Legal Care of Victims of Sexual Violence, available at:

http://www.who.int/violence_injury_prevention/resources/publications/med_I eg_guidelines/en/

Zierler, S. et al. 1991, 'Adult Survivors of Childhood Sexual Abuse and Subsequent Risk of HIV Infection' American Journal of Public Health Vol 81(5) 572-5.

Research on violence and injury prevention could save millions of lives every year



Article by Etienne G Krug (pictured) and David R Meddings

ith more than five million deaths every year, violence and injuries account for 9% of global mortality (World Health Organization, 2002). Seven of the 15 leading causes of death for people between the ages of 15-44 years are injury-related. There are traffic injuries, homicides, suicides, war injuries, drowning, burns and poisonings. Children and young adolescents are also particularly vulnerable to injury. Injuries also cause tens of millions of disabilities each year. Responding to injuries and their numerous consequences requires extensive health system resources. Injury death and disability rates vary greatly by sex: for most types of injuries, death rates are higher for males, whereas women are at higher risk for non-fatal injuries resulting from sexual or intimate partner violence and, in some regions, for burn injuries.

The burden imposed by violence and injury is particularly heavy on low-income families and societies with high levels of economic inequality. Injury-related death and disability rates are generally higher in low- and middle-income countries; in communities of migrants; ethnic minorities; marginal groups; or in areas with high rates of unemployment. Despite the scale of the health impacts, the traditional view of injuries as 'accidents' suggesting that they are random unavoidable events has resulted in their historical neglect, both as a subject of research and as a preventable outcome. Injury-related research expenditure has been shown to lag well behind other health outcomes when considering global research expenditure per DALY (Ad Hoc Committee, 1996), and this relative lack of investment has also been documented within regions such as sub-Saharan Africa (Isaakidis, 2002).

Understanding the consequences

Despite insufficient investment in injury-related research, the research that has been conducted has provided a better understanding of the wide range of consequences of injuries. Studies have shown for example that consequences of child maltreatment are much broader than death and injury and include very serious harm to the physical and mental health and development of victims. Studies indicate that exposure to maltreatment and other forms of violence during childhood is associated with risk factors and risk-taking behaviours later in life such as violent victimisation and perpetration, depression, smoking, obesity, high-risk sexual behaviours, unintended pregnancy, alcohol and drug use. Such risk factors and behaviours then lead directly to some of the leading causes of death, disease, and disability, namely heart disease, cancer, suicide, and sexually transmitted diseases (Krug et al., 2002; Felitti et al., 1998).

Evaluation research has also provided clear evidence that a range of interventions can prevent injuries. In Thailand research showed a 41.4% reduction in head injuries and a 20.8% reduction in deaths in the year following the enforcement of a motor cycle helmet law (Ichikawa et al., 2004). The benefits have also been shown of a number of other interventions, such as using child safety devices and seat belts for prevention of damage during car crashes; setting and enforcing legal blood alcohol limits for traffic injury prevention; child resistant containers for prevention of poisonings; home hazard modification to prevent falls in the elderly; appropriate ground surfacing in playgrounds; pool fencing to reduce the risk of drowning; or home visitation programs for reducing child maltreatment.

However, despite these successes, injury prevention research remains one of the most neglected areas of public health. The scale of the disproportionate lack of investment is of several orders of magnitude. The previously cited 1996 WHO report on Investing in Health Research and Development showed that, on a per DALY basis, health research funding spent on road traffic injuries was respectively 12, 16, and 103 times smaller than research on blindness, asthma or HIV (Ad Hoc Committee, 1996).

In addition to the overall lack of spending, the geographical distribution of existing research efforts on injuries and violence prevention remains very unequal. Very little injury-related research - particularly evaluation research - has been conducted in low- and middle-income countries, despite injury and violence representing an even more important component of the burden of disease in these settings than in high-income countries. Over the past years, a few international networks such as the Road Traffic Injury Research Network (RTIN) and the Injury Prevention Initiative For Africa (IPIFA) were set up to strengthen research in low- and middle-income countries.

The millenium development goals and injury

Injury and violence prevention and research efforts should be

scaled up considerably if we want to achieve the Millennium Development Goals. The backdrop referred to previously of a long-standing and profound degree of neglect in terms of investment in injury prevention and research, makes the needs even bigger. In many countries, the capacity to address injuries is just emerging. Many low-income countries do not yet have national focal points and plans of action for addressing injury prevention and have only few mechanisms by which data on injury related conditions are gathered, analysed and interpreted. Legislation is often lacking, or when it exists, the tools for its implementation are limited. Mechanisms for the multi-sectoral collaboration needed to address injuries are also often in need of development.

In addition to these general considerations, specific linkages with a number of the Millennium Development Goals may be made to illustrate why injury prevention is important for achieving the MDGs. For example, drowning and road traffic injuries are among the 15 leading causes of death for children under five years old. We therefore need to address them if we want to significantly reduce childhood mortality rates (MDG 4).

Studies at family and community level have shown that road traffic injuries contribute to poverty mainly because they affect predominantly young people, often the breadwinners, and because of the high costs of treatment and rehabilitation (Peden M, et al., 2004). Similar studies have shown links between drowning, burns or violence and poverty. At an international level, it has been shown that countries spend 1–2% of their GNP on dealing with road traffic crashes, and a similar amount on meeting the direct medical costs of treating the consequences of interpersonal violence. In any setting, the poor are at particularly high risk of injury. Therefore, additional injury prevention strategies need to be implemented and evaluated if we want to eradicate extreme poverty (MDG 1).

Gender equality and empowerment of women (MDG 3) cannot be achieved if we do not address some of the main issues affecting women: intimate partner and sexual violence. Studies in several countries have shown that 10-69% of women report having been victimised by violence at the hands of an intimate partner at some points in their lives; that in some countries up to 40% of women report that their first sexual intercourse was forced; or that in some countries 20% of women report having been abused as children (Kruget al., 2002). These violent events leave deep scars in the lives of hundreds of millions of women and the threats of such violence confines them very often to unequal positions in society. Recent research has also shown that sexual violence is an important contributor to the spread of HIV/AIDS. Additional research programmes on ways to prevent sexual violence and effective tools to deal appropriately with victims of sexual violence are therefore needed to contribute to the achievement of MDG 6 on combating HIV/AIDS, malaria and other diseases.

Additional funding areas

Owing to the degree of neglect and lack of investment in injury-related research there are many potential areas where increased investment in research funding for injury could be made. A number of priority areas deserve particular attention:

- While there are a considerable number of descriptive studies already, we need to continue to better document the magnitude of the problem particularly in low- and middle-income countries. Most existing studies have focused on fatal consequences and are conducted on small samples. Larger studies describing non-fatal injuries and their multiple consequences, including on disability and rehabilitation, as well as the economic impact, are lacking from many parts of the world. These efforts will require a range of data collection methodologies, including surveillance systems and injury outcome focused surveys.
- ♣ Injuries and violence tend to be considered as isolated areas in public health. Yet there are important linkages between injuries and a range of other health conditions. To strengthen and potentially integrate responses it is important to identify more clearly these linkages the links, for example, between violence and the spread of HIV/AIDS or non-communicable diseases or between all types of injuries and mental health. As shown above, studies that have demonstrated the impact of violence in early childhood on risk behaviours in adulthood and through this on many of the leading causes of death, mean that violence is a much more cross-cutting causal factor in the burden of disease than often is recognised (Felitti et al., 1998).
- ♣ As mentioned previously the vast majority of evaluation efforts assessing the effectiveness of interventions to prevent injury have been conducted in high income countries. While many lessons apply to the lower- and middle-income countries, many of these programmes require modification for these settings in order to be more effective and adapted to the local reality. How for example can we develop lighter but effective motorcycle helmets for people living in hot climates?
- Research topics should not follow trends but should focus on all areas where prevention is possible. The recent reports of WHO on violence and road traffic injury prevention do much to set forward a framework of recommendations to guide rational allocation of research funds in the injury area (Krug et al., 2002; Peden et al., 2004).
- ♣ Large international collaborations are needed to address some of the research questions that require bigger samples. The networks to set up such collaborations are still rare, particularly amongst those researchers engaged in injury-related research. The CRASH trial coordinated by the London School of Hygiene and Tropical Medicine to try to better determine the effects of the use of corticosteroids to improve outcomes after head injury is an interesting example of such a network. The WHO collaborative study on alcohol and injuries (12 countries) is another example of a research network involving international collaboration to assess the feasibility of using ICD Y91 coding to clinically assess alcohol intoxication among injured people.

Finally, more research is needed to better determine the needs of survivors of injuries and their families and how to strengthen the health service responses. Little is known about for example the access to rehabilitation services for survivors of spinal cord or brain injuries in low- and middle-income countries. Or, what is the best pre-hospital care system in areas where communication is difficult, congestion is great or vehicles are rare?

During the last two years, the World Health Assembly (WHA) the annual gathering of Ministers of Health and other senior national and international decision makers in health has passed two important resolutions calling for more research on injuries and violence prevention: WHA 56.24 -'Implementing the recommendations of the World report on violence and health' (World Health Assembly, 2003) and WHA 57.10 - 'Road safety and health' (World Health Assembly, 2004). Both resolutions followed the publication of important reports - the World Report on Violence and Health (Krug et al, 2002) and the World Report on Road Traffic Injury Prevention (Peden et al, 2004) - which, among their main recommendations, also called for more health research in this area. These documents represent unprecedented commitments made by governments and are important

opportunities for the research community. Scientists should seize these opportunities to strengthen research in this area where many millions of lives could be saved and disabilities prevented every year. Without the combined efforts of governments and research entities the full health impact of injury will remain, as an undiminished brake on global development.

Etienne Krug is Director of the Department for Injuries and Violence Prevention at the World Health Organization in Geneva, Switzerland, where amongst other issues, he has co-ordinated the development of WHO's first World Report on Violence and Health and overseen preparations for World Health Day 2004, dedicated to Road Safety. Before joining WHO, Dr Krug worked at the US Centers for Disease Control and Prevention and in war torn countries for Médecins sans Frontières and the United Nations High Commissioner for Refugees.

David Meddings works in the Department of Injuries and Violence Prevention of the World Health Organization, where he coordinates capacity building work, a multi-country study in collaboration with the UN Development Programme on prevention of armed violence, and the departmental strategy on drawing the linkages between health and human security concerns.

References

Ad Hoc Committee on Health Research Relating to Future Intervention Options, 1996. Investing in Health Research and Development. World Health Organization, Geneva (Document TDR/Gen/96.1).

Felitti VJ, Anda RF, Nordenberg D, et al. 1998. 'Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study'. Am J Prev Med. 14:245-258.

Ichikawa M, Chadbunchachai W, Marui E. 2004. 'Effect of the helmet act for motorcyclists in Thailand'. Accident analysis and prevention. 35:183-

Isaakidis, P, Swingler, GH, Pienaar, E, Volmink, J, Ioannidis, J, 2002. 'Relation between burden of disease and randomised evidence in sub-Saharan Africa: survey of research'. BMJ 324: 702.

Krug, EG, Dahlberg, LL, Mercy, JA, Zwi, AB, Lozano, R, eds. 2002. World report on violence and health. Geneva, World Health Organization.

Peden M, et al (eds). 2004. World report on road traffic injury prevention. Geneva: World Health Organization.

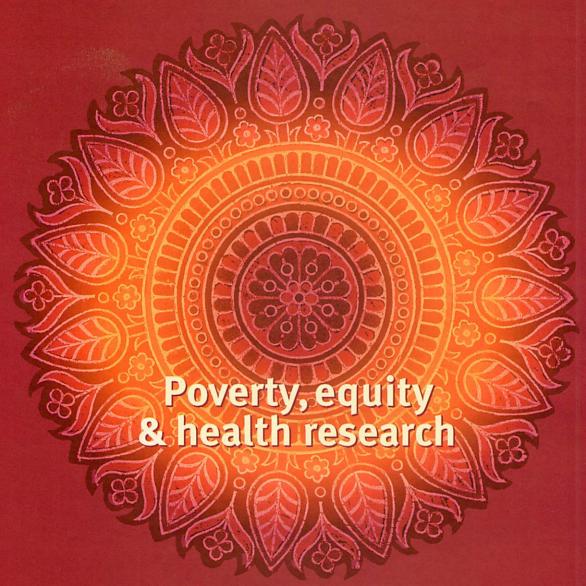
World Health Assembly, 2003, Implementing the recommendations of the World Report On Violence And Health. Geneva. World Health Organization. (WHA 56,24).

World Health Assembly, 2004. Road safety and health. Geneva. World Health Organization. (WHA 57.10).

World Health Organization, 2002. Injury: A leading cause of the global burden of disease, 2000. World Health Organization, Geneva, 2002.

Global Forum for Health Research

HELPING CORRECT THE 10 | 90 GAP



Forum 9

12-16 September 2005

लपलिकां. india

www.globalforumhealth.org

Cross-cutting issues

- 130 Health research, poverty and equity Timothy Evans,
 Alec Irwin and Jeanette Vega
- why health research needs to be more sensitive to sex and gender differences **Lesley Doyal**
- 138 Disabled people, science and technology and health research **Gregor Wolbring**
- **142** Ethics and health research for development: an essential combination **Carel IJsselmuiden**

Health research, poverty and equity



Article by Timothy Evans (pictured), Alec Irwin and Jeanette Vega

odern health research has brought remarkable gains in human well-being, but its benefits have not been evenly shared. Today, as scientific knowledge progresses swiftly, gaps in health status and outcomes are widening - between countries and among more and less advantaged social groups within many countries (WHO, 2003). Indeed, many recent scientific and technological advances have tended to exacerbate health inequalities, as already privileged groups disproportionately capture the benefits of knowledge and innovation to which less advantaged communities have little access (Acheson, 2000). To reverse these trends, the health research community should actively embrace equity as a guiding principle. To do so, however, will require critically evaluating many aspects of current research practice, including ways in which powerful political and economic interests influence research agendas in directions unlikely to meet the most urgent needs of the poor or to promote equity.

Much is already known about the links between poverty, social exclusion and people's chances for a healthy life. Research must move beyond refined descriptions of the problem of health inequities to focus on identifying and promoting effective solutions. Genuinely pro-equity research must be action-oriented; it must accompany, support and accelerate practical interventions and policy change. To adopt such an approach will entail changes in health research priorities and methods. But the alternative is an unacceptable scenario in which progress in health research will fuel increased marginalisation and a widening chasm in health status between haves and have-nots.

This article begins by examining several conceptual issues connected with poverty, health equity and research frameworks. It enumerates priority areas for health equity research. Finally, it briefly discusses a process - the WHOsponsored Commission on Social Determinants of Health which exemplifies some of the strategies that may characterise equity-oriented health research in the years ahead.

Poverty, equity and research: conceptual groundwork

Poverty powerfully attacks many aspects of people's health. Thus the imperative to reduce poverty and to mitigate its damaging effects is central to a pragmatic research agenda

focused on understanding the causes of ill-health and identifying practical levers for improving the health of disadvantaged populations. On the other hand, better knowledge of the distribution of health within societies has led to widening recognition that socially-related ill-health and premature death affect many people who are not officially classified as poor, while within poor communities some groups - for example women - suffer disproportionately. For maximum effect, the effort to address the health effects of poverty must be integrated within a broader approach grounded in the concept of equity.

Equity as analysed by authors including Margaret Whitehead and Paula Braveman is a normative concept equivalent to fairness or justice. In operational terms, 'pursuing equity in health can be defined as striving to eliminate disparities in health between more and lessadvantaged social groups' (Braveman, 2003, p.182). Income and wealth are important social stratifiers, but not the only ones that differentially influence people's chances to lead healthy lives. Occupation, education, geographic location (e.g., urban vs. rural habitat), gender, race or ethnicity, religious affiliation and other forms of social classification intersect with income and material possessions to produce hierarchical patterns of privilege and exclusion with crucial implications for health. Across the world, health status and outcomes are strongly correlated with social position.

The goal of pro-equity health policy is not to eliminate all health differences, but to reduce or eliminate disparities that result from 'factors considered to be both avoidable and unfair.' Equity is thus 'concerned with creating equal opportunities for health and with bringing health differentials down to the lowest level possible' (Whitehead 1990, p. 9). Pro-equity health research will then be understood as research that supports this agenda by supplying the knowledge, tools and strategies needed to clarify the scope and determinants of health inequities and translate equity commitments into effective interventions and measurable reductions in health gaps. Since pro-equity health interventions unfold within and depend upon political contexts, an important part of the pro-equity research agenda will involve the analysis of the political forces and factors that enable or impede implementation of interventions and strategies likely to improve the health status of disadvantaged groups.

The introduction of equity as a key dimension for theory and practice in health research of course raises questions at various levels. One set of questions might be termed 'frontier and framework' issues, i.e., those having to do with clarifying the conceptual framework(s) of health equity; identifying the determinants of health inequalities and the precise pathways by which factors such as professional hierarchies lead to differential health outcomes; and deciding how health inequities and associated processes should be measured. Here it will be necessary to grapple with problems such as what counts as 'evidence' in analysing social processes related to health. A second broad set of questions can be thought of as 'action and applied' issues that relate to how health inequities should be addressed in practice. Beyond rhetorical commitments, how can health equity be concretely advanced through policies in the health sector and in other relevant sectors?

Equity in health research has increased quantitatively over the past decade. Studies that explicitly look at within-country as well as between-country differentials in health are on the rise. However, much more evidence on pathways and successful interventions is needed in order to fully integrate equity perspectives into key global health and development processes. For example, the targets and indicators identified for the health-related Millennium Development Goals (MDGs) are based on aggregates, with no explicit attention to distribution. Gwatkin (2002) has shown that key healthrelated MDGs could be met in some countries by improving the lot primarily of relatively privileged population groups, leaving the situation of the poorest and most disadvantaged largely unchanged. As global mobilisation around the MDGs intensifies, it is urgent that these equity issues be brought forward forcefully and that distributional effects be integrated into measurement and reporting of progress toward the goals.

Priority areas for health equity research

Östlin and colleagues in the WHO Task Force on Research Priorities for Equity in Health and the WHO Equity Team (Östlin, 2004) have recently identified a set of key areas in which equity-oriented health research must move forward aggressively. They are: (1) global factors and processes that affect health equity; (2) the specific societal arrangements that differentially affect people's chances to be healthy within a given society; (3) the inter-relationship between individual factors and social context that increase or decrease the likelihood of achieving and maintaining good health; (4) health care system factors which influence health equity; and (5) effective policies and interventions to reduce inequities.

At the current time, the issue of global factors and macroeconomic processes may be the most important. Global factors affecting health equity include trade in health damaging products such as arms and tobacco, migration of people displaced by conflict and/or poverty, new environmental threats, and shifts in the global political

economy allowing creation of global production chains and integrated markets. These phenomena are driven by macroeconomic processes and policies including international trade agreements (e.g., the General Agreement on Trade in Services) and conditionalities for lending, development assistance or debt relief through international financial institutions. Dominant trends tend to constrain the agency of national governments in developing countries. For example, countries are asked to improve efficiency while macro-structural adjustments are simultaneously imposed that block the use of available donor funds; then countries are blamed for inefficient absorption of these funds. The differential health impacts of such global processes and macroeconomic policies at country level need to be assessed on a priority basis. Globalisation, particularly in the economic realm, has both positive and negative impacts, but existing evidence suggests that recent processes have tended to have a prejudicial effect on the health of vulnerable groups (Labonte et al., 2004). In addition to clarifying the causal relationships involved, researchers must ask whether other forms of globalisation are possible, and what knowledge would be needed to bring them about.

Social arrangements and policies within countries have a major impact on determinants of population health. Dimensions of concern include policies on the labour market and income maintenance (Diderichsen, 2002), gender norms (Sen et al., 2002), land use, access to social services, education, environmental protection, water and sanitation, transport and security, in addition to healthcare. Many of these issues lie outside the direct remit of the health sector, but health officials can play a key advocacy role in promoting incorporation of health objectives into goal-setting and planning in other governmental sectors. Indicators and methods need to be further developed to enable decision-makers to assess the health equity impact of health systems policy and policy options in other sectors (Lehto and Ritsatakis 1999; Whitehead et al., 2000).

Numerous studies of health inequalities have focused on individual 'risk factors,' such as smoking, alcohol consumption, eating patterns, and blood pressure. The burgeoning literature on the social determinants of health emphasises how people's chances to be healthy are increased or decreased through the interrelationship between individual risk factors and social position: including income level, place of residence, gender, ethnicity, educational attainment, work environment, etc. An individualistic risk factor approach fails to uncover contextual mechanisms behind social inequities in health and ignores that influences on health accumulate over the life course (Dean, 1993). Social context and social position play an important role in on the one hand increasing exposure and vulnerability to disease and on the other predisposing marginalized groups to heavier social consequences from disease or injury (Diderichsen et al., 2001). The evidence base in this regard exhibits major gaps (Marmot and Wilkinson, 1999; Evans et al., 2001;



A new departure in food fortification

The Global Alliance for Improved Nutrition supports and advocates sustainable nutrition strategies, especially food fortification for better health in developing countries.

Food fortification - the addition of vitamins and minerals to staple foods and condiments - is a well-established technology with many private, public and civil society organisations active in the area. Yet in spite of these efforts, 2 billion people worldwide still suffer from vitamin and mineral deficiencies. Women and children are particularly at risk.

By 2007, GAIN aims to contribute to the improved nutritional status of at least 600 million people in up to 40 developing countries.

GAIN makes grants available for countries to accelerate their fortification programmes. Its main, responsibility is to put in place an enabling structure that will ensure that the right food is fortified with the right nutrients and made available through market mechanisms and at prices that guarantee access to those that need it. Innovative strategies such as cross-subsidies, special packaging and special distribution channels are promoted to reach even the most deprived sectors of the community.

Established in 2003, GAIN is currently providing support worth a total of some \$30 million to National Fortification Alliances in 11 countries for the implementation and strengthening of national food fortification programmes, aimed at poor and deficient populations.

On a global level, GAIN collaborates closely with UNICEF, WHO, UNDP, the World Food Programme (WFP), The World Bank and World Bank Institute, the US Centers for Disease Control and Prevention (CDC), the International Business Leaders Forum (IBLF), Consumer Voice, The Micronutrient Initiative (MI), other UN agencies and NGO's.

For more on GAIN see www.gainhealth.org
The Global Alliance for Improved Nutrition - Geneva, Switzerland

How health equity is impacted by health care system factors also needs to be better understood – with central attention to issues such as what constitutes equitable financing, balance of public and private sector responsibilities and the equity effects of the health sector reform processes unfolding in many countries over the last two decades

Almeida et al., 2003). There is much still be learned about the specific pathways by which disadvantaged social positions translate into ill health.

How health equity is impacted by healthcare system factors also needs to be better understood – with central attention to issues such as what constitutes equitable financing, balance of public and private sector responsibilities and the equity effects of the health sector reform processes unfolding in many countries over the last two decades. Systematic reviews and primary research are needed to document the effects on health equity of the increasing marketisation of health care. Such research should not only focus on how one may improve the quantity, distribution and quality of health services from a supply-side perspective, but also address the possible obstacles to using services when needed from a demand-side perspective (Standing, 2004).

Previous research on how equity in health has been affected by health sector reforms suggests that many of the reforms have raised barriers to access to essential care for the less well off. Despite rhetorical acknowledgement that public expenditure cuts and the imposition of user fees have

impeded access, little has been done in many instances to protect the most vulnerable segments of the population (Bangser, 2002). Of importance for researchers is the fact that many reforms were introduced on the basis of scant evidence and maintained even when evidence began to show their negative effects. In other words, political interests are often stronger than evidence - a reality with which the research community needs to grapple more explicitly and critically. 'Evidence' feeds into, but is also itself moulded by, political and social processes. It is never independent of these processes. The health research community needs to become more self-conscious about the political situatedness of its work. This will be particularly important in addressing sensitive and complex issues such as health sector reform, health and trade (including the liberalisation of trade in services) and the global health workforce crisis.

Finally, Östlin and colleagues argue, the health equity research agenda must aim to identify effective pro-equity policy approaches and cost-effective interventions. A particular paucity of information exists on interventions that have successfully addressed social determinants of health inequities, and little concrete guidance is available to policy-makers. Research must be oriented toward policy solutions that can effectively link priority targeted health programmes; strengthening of the broader health system; and action on the social determinants of health. The health sector should play an advocacy role in catalysing and guiding multisectoral action to address the social determinants of health. A key task for equity-oriented health systems research is to identify

strategies and 'pressure points' for this process.

Conclusion: research and political action

Striking aggregate gains in health over recent decades have been accompanied by widening gaps in health status and outcomes between privileged and marginalised groups, between and within countries. Providing knowledge and tools to reduce these disparities is a pivotal challenge for research. Research on poverty, equity and health must be actionoriented and focused on catalysing concrete change in the health sector and the wider social and governance context. Equity-oriented research may explore new modes of collaboration between researchers, political decision-makers and affected communities. It may and should try to build closer linkages between 'bottom-up' knowledge generation and social mobilisation processes at the community level; university-based researchers in developed and developing countries; national policy-makers; and the normative authority and convening power of multilateral institutions including WHO

A concrete example of how this might work in practice is the WHO-sponsored global Commission on Social Determinants of Health, which will operate from mid-2005 to mid-2008. WHO Director-General Lee Jong-Wook has identified the Commission as part of the Organization's effort to re-infuse global health work with the equity vision that shaped WHO's 1946 Constitution and informed milestone documents such as the 1978 Declaration of Alma-Ata (Lee, 2004). The starting point for the Commission's work is the recognition that healthcare and health technologies alone cannot get at the root of today's most important health problems. Most suffering and premature death in the world and the bulk of health inequalities are caused by social factors including poverty, nutrition, gender and ethnic discrimination, access to water, education, housing and children's early life conditions. To improve health in vulnerable communities and make equitable progress toward the health-related MDGs requires concerted action on the social determinants of health.

The most important objective of the Commission will be to leverage policy change by turning existing public health knowledge into actionable global and country-level agendas. To achieve this, the Commission will co-ordinate a major effort to compile information on social determinants of health and on effective pro-equity interventions from all global regions. through regional and theme-based Knowledge Networks. These networks will link partners including academic research centres and scientists in developing and developed countries; civil society groups; the private sector; policy-makers and implementers. An expanded evidence base on social determinants and strengthened research capacities in collaborating countries will be the concrete product of this effort. The Commission itself will include 12-16 commissioners whose main role will be using the evidence compiled to advocate with Member States and the global community for implementation of pro-equity health policies that include specific actions on social determinants. Thus the Commission will embody a health research model uniting the strengths of multiple actors and tightly linking scientific knowledge generation to the agendas of affected communities and to policy implementation.

The Commission on Social Determinants of Health will aim to catalyse policy change in countries, across the global health community and within WHO itself. The Commission is part of a process by which WHO is concretely re-embracing Health For All commitments and working with partners to place equitable progress in health at the centre of the development agenda. Joining forces in this effort, health researchers, policymakers, implementers and communities can achieve major health advances for the world's most vulnerable people in the years ahead.

Timothy Evans is Assistant Director-General, Evidence and Information for Policy, World Health Organization, Geneva. A Canadian with Bachelor of Social Sciences (University of Ottawa), PhD in Agricultural Economics (University of Oxford) and Doctor of Medicine (McMaster University), he was an assistant Professor of International Health Economics at the Harvard School of Public Health, and most recently served as the Director of Health Equity at the Rockefeller Foundation from 1997 to 2003.

Alec Irwin is a member of the Health Equity Team, WHO, Geneva. He is co-author, with Joyce Millen and Dorothy Fallows, of Global AIDS: Myths and Facts (Boston: South End Press, 2003).

Jeanette Vega is the Team Leader of the Health Equity Team, World Health Organization, Geneva since January 204. Before joining WHO she was the Director of the Institute for Epidemiology and Public Health Policy at the Universidad del Desarrollo in Chile.

References

Acheson, D, 2000. 'Health inequalities impact assessment,' Bulletin of the World Health Organization, vol. 78, no. 1, pp. 75-76.

Almeida Filho, N., Kawachi, I., Pellegrini, A. and Dachs, N, 2003. 'Research on health inequalities in Latin America and the Caribbean: Bibliometric Analysis (1971-2000) and Descriptive Content Analysis (1971-1995),' American Journal of Public Health, Vol. 93, No. 12, pp. 2037-2043.

Bangser, M., 2002. Policy environments: macroeconomics, programming, and participation, in: Sen, G., George, A., Östlin, P. (eds), Engendering

international health: the challenge of equity, MIT Press, Cambridge.

Braveman, P, 2003. 'Monitoring Equity in Health and Health Care: A Conceptual Framework,' Journal of Health, Population and Nutrition, Vol. 21, No. 3, pp. 181-192.

Dean, K, 1993. Integrating theory and methods in population health research, in: Dean, K. Population health research: linking theory and methods, Sage, Thousands Oaks, California.

References continued

Diderichsen, F, 2002. Income maintenance policies: determining their potential impact on socio-economic inequalities in health, in: Machenbach, J.P., Bakker, M.J. (eds), Reducing inequalities in health: a European perspective, Routledge, London.

Diderichsen, F, Evans, T, Whitehead, M, 2001. The social basis of disparities in health, in: Evans, T., Whitehead, M., Diderichsen, F., Bhuiya, A., Wirth, M. (eds), Challenging inequities in health: from ethics to action, Oxford University Press, New York.

Evans, T, Whitehead, M, Diderichsen, F, Bhuiya, A, Wirth, M, 2001. Challenging inequities in health: from ethics to action, Oxford University Press, New York.

Gwatkin, D, 2002. Who would gain most from efforts to reach the MDGs for health? An enquiry into the possibility of progress that fails to reach the poor, World Bank, Washington, DC.

Labonte, R, Schrecker, T, Sanders, D, Meeus, W, 2004. Fatal Indifference: The G8, Africa and Global Health, University of Cape Town Press, Cape Town.

Lee, JW, 2004. Address to the 57th World Health Assembly. Geneva, 17 May 2004.

Lehto, J, Ritsatakis, A, 1999. Health impact assessment as a tool for intersectoral health policy, European Center for Health Policy/WHO

Regional Office for Europe, Brussels.

Marmot, M, Wilkinson, R, 1999. Social determinants of health, Oxford UP, New York.

Östlin, P. 2004. WHO Task Force on Research Priorities for Equity in Health, WHO Equity Team: 'Priorities for research to take forward the health equity policy agenda,' unpublished draft paper.

Sen, G, George, A, Östlin, P, eds., 2002. Engendering international health: the challenge of equity, MIT Press, Cambridge.

Standing, H, 2004. Understanding the 'demand side' in service delivery. Definition, frameworks and tools, DFID, London.

Whitehead, M, 1990. The concepts and principles of equity and health, WHO, Copenhagen.

Whitehead, M, Burström, B, Diderichsen, F, 2000. 'Social policies and the pathways to inequalities in health. A comparative analysis of lone mothers in Britain and Sweden,' Social Science & Medicine, Vol. 50, pp. 255-270.

World Health Organization, 2003. World Health Report 2003: Shaping the Future, WHO, Geneva.

Why health research needs to be more sensitive to sex and gender differences



Article by Lesley Doyal

uring the last decade there has been a growing acceptance of the importance of gender concerns in public policy in general and in health policy in particular. This shift has been justified on the basis of two main arguments. First, the principles underlying equity and human rights agendas require that women and men should both have appropriate opportunities to realise their potential for health and well-being. And second, the delivery of effective and efficient services can only be fully achieved if all the differences between women and men are properly recognised and incorporated into health policies and practices.

Discussion of gender issues has traditionally focused on women and especially on those who make up the majority of the world's poor. The health of these women is too often damaged not just by their poverty but also by the failure to meet their sexual and reproductive health needs and by the wider gender inequalities that continue to shape their lives. However it is increasingly clear that men too can be harmed by their male status and again it is the poorest who are often at greatest risk. Health researchers will not generate the best evidence to meet the needs of the most vulnerable unless maleness and femaleness are taken just as seriously as the more widely accepted determinants of health such as race, class and ethnicity.

There are marked differences in patterns of health and illness experienced by women and men. The most obvious reflect biological or sex differences and often relate directly to male or female reproductive functioning with women facing particular risks as a result of their capacity for childbearing. Diseases such as cancer of the cervix or prostate are clearly sex-specific but a growing volume of research has highlighted broader genetic, hormonal and metabolic differences between the sexes (Wizemann and Pardue, 2001). Men appear to be

The health of these women is too often damaged not just by their poverty but also by the failure to meet their sexual and reproductive health needs and by the wider gender inequalities that continue to shape their lives. However it is increasingly clear that men too can be harmed by their male status and again it is the poorest who are often at greatest risk

inherently more susceptible to infectious diseases such as tuberculosis for example, while women are more likely to develop auto-immune problems. More research is needed to identify these differences and to assess their implications for both preventive and treatment strategies.

However biological differences are not the only ones shaping variations in male and female patterns of health and illness. Women and men often lead very different lives, even when they live in the same place. There are marked gender differences in living and working conditions especially in some of the least developed parts of the world and this can have a major effect on human well-being (Doyal; 2001, Sen, George and Ostlin, 2002). The different definitions of male and female duties and their unequal entitlement to resources can put the two groups at differential risk of developing some health problems while protecting them from others.

There is now an extensive literature documenting the relationship between economic, social and cultural factors and women's mental and physical well-being. The gender divisions in domestic work have been highlighted as a potential risk especially when they are combined with paid or subsistence work outside the home. Household hazards range from musculoskeletal injuries sustained collecting wood or water to respiratory problems exacerbated by indoor cooking with polluting fuels (Simms, 2002). Responsibility for household duties may also expose women to greater risk of water-related diseases such as schistosomiasis (Simms,

Gender-based violence is an additional health burden borne by women in their homes especially in situations of conflict and instability (Watts and Zimmerman, 2002). For many, this significantly increases their chances of being infected with HIV (ELDIS, 2003; Maman, 2000). The reality of many women's lives is marked by low status and power and lack of autonomy and these have been linked to the high rates of depression and anxiety reported by females in many communities around the world (Astbury, 2002; Patel et al., 2001).

As the gendered health problems faced by women are increasingly recognised, the links between masculinity and well being are also beginning to emerge (Doval, 2001). At first sight, maleness might seem to be beneficial to men's health because it offers them access to a greater range of potentially health promoting resources. But being a man may

also require the taking of risks. In many societies the traditional role of breadwinner continues to put men at greater risk than their partners of dying prematurely from occupational injuries. In order to demonstrate their masculinity they are more likely to engage in dangerous activities such as smoking, drinking to excess, driving too fast and having unsafe sex. They also run a higher risk of dying as a result of either individual or collective violence with other men

As well as being a major determinant of health, gender also influences the access of individuals to health services. In many parts of the world, women have less entitlement than men to food and to medical care. Where state funding is

Researchers themselves need to be aware of gender concerns at all stages of their work from the initial design to the dissemination process. And policy makers need to look very carefully at the sex and gender implications of all research findings before using them to develop services

inadequate, women usually have fewer financial resources to pay for treatment and in some places this has been exacerbated by the processes of health sector reform (Standing, 1997). On the other hand, men's access to health care may be limited by their own reluctance to admit weakness (Cameron and Bernardes, 1998; Doyal, 2001). There is also evidence that women and men may receive treatment of differing quality. Many women have spoken of the lack of respect they experience from health workers and this seems to be especially common among the poorest (Ravindran, 1995).

In light of the obvious importance of both sex and gender as determinants of health, greater sensitivity to these issues is needed in all areas of policy and service delivery. But this will not be achieved unless researchers work much harder to generate an appropriate knowledge base (Doyal, 2003). Failure to take these issues seriously is likely to lead to inaccurate or biased findings. Clinical practice based on the incomplete or misleading results derived from such bad science will contribute to the continuation of avoidable mortality, morbidity and disability. And lost opportunities of this kind are clearly unacceptable especially in the context of the problem of the '10/90 gap' (Global Forum for Health Research, 2004).

All those involved in the commissioning and funding of research need to take sex and gender issues seriously. Whether they are private companies, government bodies, research councils or charities, an appropriate recognition of gender issues should be one of the criteria used for evaluating both the relevance and the scientific quality of proposals. Researchers themselves need to be aware of gender concerns

at all stages of their work from the initial design to the dissemination process. And policy makers need to look very carefully at the sex and gender implications of all research findings before using them to develop services.

Strategies for ensuring that research captures and reflects the differences between women and men will vary depending on the type of study being undertaken. However the overall objective must be to ensure that both sex and gender are incorporated as key variables in all research designs, unless there is are clear reasons for assuming that they are not relevant to the problem under investigation. Thus the population of subjects needs to include sufficient numbers of women and men so that any sex or gender differences can be identified in the analysis. Any differences that do emerge then need to be clearly presented in the findings and their social and/or biological causes and implications discussed. In the context of clinical trials this will need to include an assessment of the significance of any observed differences for both male and female patients who might be treated in future with the treatment being evaluated.

These changes will not be achieved without considerable effort. Policies will be required to build the capacity for sex and gender-sensitive work among researchers in different parts of the world. This will be especially important in the many countries where medical research is still in its early stages. More conceptual and interdisciplinary work will be needed to disentangle the links between biological sex and social gender and to clarify their relationship with the wider determinants of health. This in turn will require closer working between biomedical and social scientists especially in those developing countries where the complexity of gender divisions in economic, social and cultural life remains largely unexplored.

Finally, it is important that strategies are devised to ensure that women are able to play a more active role in health research both as scientists and as advocates. Policies designed to build research capacity in those countries where it is weakest should include strategies designed to tackle those obstacles that currently prevent women from entering the field of medical research on equal terms with men. More work is also needed to enable women from a range of constituencies to become actively involved alongside men in the determination of research priorities, in the design and implementation of particular studies and in wider debates about their implications for gender equity. \square

Lesley Doyal is Professor of Health and Social Care at the School for Policy Studies, University of Bristol. She acts as a consultant on gender issues to a number of international organisations including the Global Forum for Health Research and the World Health Organization.

References

Astbury, J, (2002). 'Mental health, gender bias, social position and depression' in G Sen, A George & P Ostlin (Eds) *Engendering International Health* Harvard University Press: Cambridge MA

Cameron, C, and Bernardes, D, (1998). 'Gender and disadvantage in health: men's health for a change' *Sociology of Health and Illness* 18: 673-693

Doyal, L, (2001). 'Sex, gender and health: the need for a new approach.' $BMJ\ 323\ 1060\text{-}1063$

Doyal, L, (2003). 'Sex and gender: the challenges for epidemiologists.' *International Journal of Health Services* 33, 3 569-579

ELDIS, (2003). Dossier on Gender and HIV/AIDS available from http://www.eldis.org/gender/dossiers

Global Forum for Health Research, (2004). The 10/90 Report Global Forum for Health Research, Geneva.

Maman, S, et al, (2000). 'The intersections of HIV and violence: directions for future research interventions' *Social Science and Medicine* 50, 459-478

Patel, V, Abas, M, Broadhead, J, Todd, C, Reeler, A, (2001). 'Depresssion

in developing countries: lessons from Zimbabwe' BMJ 2001 482-484

Ravindran, TKS, (1995). 'Women's health in a rural poor population in Tamil Nadu,' in Das Gupta M, Chen LC and Krishnan TN, (eds) *Women's Health in India: Risk and Vulnerability*, New Delhi: Oxford University Press, pp. 175–;211.

Sen, G, George, A, Ostlin, P, (2002). Engendering International Health: the challenge of equity Harvard University Press: Cambridge MA

Simms, J, and Butter, M, (2002). 'Health and Environment: moving beyond conventional paradigms' in G Sen, A George A & P Ostlin (Eds) Engendering International Health: the challenge of equity Harvard University Press: Cambridge MA

Standing, H, (1997). 'Gender and equality in the health sector: a review' Health Policy and Planning 12 (1) 1-18

Watts, C, and Zimmerman, C, (2002). 'Violence against women: global scope and magnitude.' *Lancet* 359 1232- 1237

Wizemann, T, and Pardue, M, (2001). Exploring the Biological Contribution to Human Health: does sex matter? National Academy Press: Washington DC



 Committed to building capacity and serving communities to improve the delivery of health services.

 Nurturing effective collaborations and promoting practical approaches to address public health concerns.

To learn more, visit us at www.jsi.com

JOHN SNOW, INC. • 44 FARNSWORTH ST., BOSTON, MA 02210-1211 • 617-482-9485

Disabled people, science and technology and health research



Article by Gregor Wolbring

'hroughout history, science and technology and health research have had profound impacts - both positive and negative - on human kind. The goals for which science and technology and health research are advanced are not value-free - they reflect the cultural, economical, ethical, spiritual and moral framework of society.

To understand the impact of science and technology and health research on disabled people a few questions need exploring:

- Which and whose values and perceptions are reflected in the definitions of what it means to be 'healthy', of the 'problems of disabled people' and the attached 'suffering'?
- Which and whose values and perceptions are reflected in the choice of solutions for these identified 'problems'?
- How do the predominant societal values and perceptions that define health, the problems of disabled people, the attached suffering, and the proposed solutions affect the self-esteem and self-understanding of disabled people?
- Does the self-perception of disabled people match the perception that the 'non-afflicted' have of disabled people?
- Do disabled people define their 'problems' and the solutions to them in the same way as do the 'nonafflicted'?

Answering these questions requires an examination of the complex interdependent fabric of perceptions, values, and choices. It also calls for a review of the development and application of science and technology and health research from within different cultural, economic, ethical, spiritual and moral frameworks.

The situation of disabled people

More than 80% (400 million) of disabled people live in developing countries, 150 million of them between the ages of 10-24 (Groce, NE. 2003). Disabled people have limited access to education (can be as low as 3%), employment and basic healthcare (can be as low as 2%), and experience profound economic and social exclusion. Most disabled people live in poverty, prevented from fully participating in their families and communities and from benefiting from their socio-economic rights (Elwan, 1999). Eliminating world poverty and meeting the Millennium Development Goals (MDGs) is unlikely to be achieved unless the rights and needs of disabled people are taken into account (Wolfensohn, 2002).

Current understanding of disability and health and disease

Current understanding about what constitutes a disability and what individuals with a disability have to contribute to society has reframed disability as an issue of social entitlement, economic opportunity and human rights, as evidenced by the flurry of progressive legislation and new programmes around the world, including a UN international convention to promote and protect the rights of disabled persons (Worldenable, 2004).

This new understanding about disability calls for a new framework for thinking about health and how it is measured. It also calls for a rethinking of the nature of health research needed and of the implications of the development and applications of new technologies.

Disability was viewed for the longest time as a defect, a problem inherent to the person, directly caused by disease,

Current understanding about what constitutes a disability and what individuals with a disability have to contribute to society has reframed disability as an issue of social entitlement, economic opportunity and human rights

trauma, other health conditions, or a deviation from certain norms. Disability was viewed as a terrible burden, leading to a low quality of life for the person and their relatives, leading to pity and rejection.

Management of 'the disability' of the disabled person or person-to-be and the use of new technologies such as nanotechnology, biotechnology, information technology and cognitive sciences (NBIC) are aimed at 'cure' (for example gene therapy, stem cell regenerative medicine, nanomedicine), 'prevention' (prenatal genetic and non genetic diagnostics and preimplantation genetic diagnostics with the attached selection method), or 'adaptation' of the person by various normalising assistive devices (e.g. cochlear

This medical view of disability and the purely medical framework of health research and usage of science and technology are biased in that disability is viewed solely as a medical problem and other parameters are not considered

implants, artificial legs, retina chips, brain machine interfaces) to ensure functioning or existence as normative as possible.

Medical care, preventive medicine, and rehabilitation towards the norm are the primary issues. At the political and policy level, the principal response is to make medical care, preventive medicine, and rehabilitation towards the norm more efficient. On the global scale the Disability Adjusted Life Year (DALY) emerged to measure the 'burden of disease' as a tool to support the above agenda.

This medical view of disability and the purely medical framework of health research and use of science and technology are biased in that disability is viewed solely as a medical problem and other parameters are not considered. It is much too limited to address the needs of disabled people and other marginalised groups, contributing to overall global health inequities, increasing the 10/90 gap (Global Forum for Health Research, 2004) and the likelihood that the MDGs will not be met.

It results in a too narrow a policy/research focus that fails to address health as a state of complete physical, mental and social well-being and ignores the co-requisites for health such as peace, shelter, education, social security, social relations, food, income, empowerment of women, a stable eco-system, sustainable resource use, social justice, respect for human rights and equity (Jakarta Declaration, 1997) and other key determinants of health (e.g. Health Canada, 2004). It ignores the WHO aim 'to ensure equal opportunities and promotion of human rights for people with disabilities, especially those who are poor' (World Health Organization, 2004).

Instruments developed to measure health based on this limited view of health and disability, such as the DALYs, are inconsistent with today's understanding about disability and the recognition that quality of life and health depend in large measure on the socio-cultural, legal and economic ramifications of living with a disability. The DALYs are biased in that they advance a definition of health such that a disabled person is precluded from ever being considered inherently healthy.

The DALYs suggest that the prevention of impairments is the only available strategy for reducing the negative consequences of disability. They treat paraplegia, for example, the same in developed and developing countries, independent of societal parameters (Allotey et al, 2003). In developed countries many people with paraplegia have wheelchairs, reducing loss of mobility. In developing countries many do not have wheelchairs, and their mobility is severely restricted. Furthermore, wheelchairs alone are of no use

unless the environment is designed to cater to them – the provision of a wheelchair would have different effects within different social/environmental contexts.

DALYs are inadequate for measuring the global burden of disease because they do not evaluate and measure the roles played by environmental, societal and other factors in determining the severity and cause of disabilities and diseases. They are also inadequate for measuring the effectiveness of health interventions because they have not been designed to measure non-medical health interventions such as accessible environments.

Emergence of a transhumanist model of health, disease and disability

Advances in science and technology – in particular the converging of nanotechnology, biotechnology, information technology and cognitive sciences (NBIC) – give life to a third model of health. This transhumanist model of health, disease and suffering characterises health as the optimum functioning of biological systems. It is interpreted as the concept of feeling good about one's abilities, functioning and body structure. Disease is identified in accordance with a negative self-perception and sub-optimum functioning. Medical and technological interventions that add new or improve on

Under this transhumanist model, disabled people can opt to be fixed not only to a norm but also to be enhanced, augmented above the norm (e.g. giving bionic legs to amputees, which work better than 'normal' biological legs)

existing abilities of human beings are the consequences of this model. It will be increasingly difficult to distinguish between NBIC 'health products' leading to 'therapies towards the norm' and "therapies that will exceed a norm'.

Under this transhumanist model, disabled people can opt to be fixed not only to a norm but also to be enhanced, augmented above the norm (e.g. giving bionic legs to amputees, which work better than 'normal' biological legs). This follows the transhumanist vision of today's so called 'non-disabled' people who believe that every human body is defective – the transhumanist type (Wolbring, 2004). The transhumanist model is, in essence, a variation of the medical, individualistic, deficiency model.

The focus on a medical view of health, disability and disease and the increased ability of science and technology to intervene, change and modify characteristics of humans and their body increases the tendency within the industry and society to medicalise/transhumanise the human body, its characteristics, and its problems. This model leads to a subjective understanding of health in which anyone can consider themselves as 'unhealthy' and could demand treatment for themselves based on a self-identified need. It

leads to those with the most persuasive voice and economic clout controlling the research agenda and its applications. It results in 'individualised' medicine and technological solutions for the self-identified problems of those who can afford the 'fix' – the affluent. The solutions that emerge from this model lead, among other things, to an increase in the 10/90 gap and a growing inequity between poor and rich.

Setting the course for a new health policy/research agenda

A new health policy/research agenda is called for to address a) the new understanding of disability; b) the needs of disabled people and other marginalised groups; c) the emergence of the transhumanist model of health and disease; and d) the increased medicalisation/transhumanisation of human beings and their characteristics.

To begin, a new analytical model needs to be built. This model would support a broader definition of health and health research – a definition that goes beyond a medical focus on 'burden of disease' and leads to equity in health and in the use of health resources. New instruments need to be designed for measuring health, given the lack of fit of the DALYs. These new instruments must include the societal dimension of disability and health, and societal solutions. Public policies, programmes and legislations need to be examined to ensure that they are free of bias that devalue disabled persons and other marginalised groups and do not contribute to their marginalisation, exclusion and poor health.

Using the framework a new research agenda can be developed. From the beginning, this work must actively involve disabled persons and other marginalised groups; their assessment of what they need to be healthy would inform the development of the research framework and the nature of the research questions. Several core sets of questions would likely emerge. These include questions focused on:

- 1. Identifying the nature of the problem. For example, 'Is more health gained by fixing a person with a certain characteristic or by fixing the societal parameters?' or 'Taking into account the societal realities of disabled persons, are medical fixes affordable, feasible, and the most efficient use of resources? Do societal solutions better serve the persons in question, lead to improved well-being, broader health equity, and better use of limited societal resources and research dollars?'
- 2. Probing for existing biases in existing policy, research and measurement instruments, and pointing to ways for removal of the biases. For example, research needs to be undertaken to determine the extent to which many already medicalised characteristics are indeed medical conditions in need of medical interventions or whether they simply reflect intolerance of diversity and the subsequent pathologisation of anyone different from the norm. Research would need to explore who gains and who loses when these biases are left unchecked, and the resulting impact on achieving health equity, the MDGs and reducing the 10/90 gap in health research. For example, how useful is the definition of unipolar major depression as one of the leading global 'burdens of disease' (Oklahoma State Board Of Health, 2004) for

understanding what the 'problem' is, its root causes and whether medical/drug interventions are the most efficient way to deal with the 'problem'?

- 3. Identifying the determinants and co-requisites for health of disabled persons. These would focus on the non-medical components of health as they relate to disabled people and would allow the measurement and monitoring of policy decisions and their impact on disabled people and their health.
- 4. Monitoring shifts in the understanding of health and disease following advances in science and technology (see transhumanist model) and identifying and monitoring shifts in health research resource flows.
- 5. Measuring the impact of new technologies on the health of disabled persons and other marginalised groups. How would the emerging and converging NBIC technologies be best used to increase maximum health in its fullest sense? How can research agendas for emerging and existing technologies be shaped to decrease rather than increase the 10/90 gap? In the case of nanotechnology, for example, an informed research agenda may identify that more money should be invested in 'Nanowater' (Club of Amsterdam, 2004) whose application might provide cheaper ways to clean and desalinate water, benefiting many than on technologies to give humans new abilities through bodily modifications, which can be afforded by and would help only the affluent few.
- 6. Monitoring and evaluating the governance of the entire research process and subsequent technological developments and the extent to which disabled persons and their values have informed them. Questions would probe for biases in the governance, monitoring and evaluation processes. They would point to ways to ensure that disabled people and other marginalised groups play an active role in the development and applications of research agendas and new technologies, in defining science and technology and health research questions, and in the decision-making regarding health, science and technology and health research priorities. This work would be underpinned by the establishment of an ethical framework for conducting critical analysis and evaluation of emerging technologies - NBIC actively involving disabled people and other marginalized groups to ensure that their rights are protected. A core part of the overall governance would be the establishment of a network of disabled and other marginalised people to provide guidance for shaping the policy and research questions, agenda and priorities and the most effective and equitable use of new emerging technologies.

A policy and research agenda that perpetuates a pervasive bias leading to the pathologisation of people different from the norm, and supports their prevention, marginalisation, exclusion and elimination, must be questioned. It results in gross inequities and discrimination against disabled people, and has opened the door to the encroaching transhumanist model and its subjective definition of health where anyone can consider themselves as 'inherently unhealthy' in a medical sense in need of a medical cure.

A new framework for disability, health and health research,

A policy and research agenda that perpetuates a pervasive bias leading to the pathologisation of people different from the norm, and supports their prevention, marginalisation, exclusion and elimination, must be questioned

grounded in and informed by the lived experience of disabled and other marginalised people, is imperative to achieve health equity and improved health status for the worlds majority marginalised population, to meet the MDGs and to reduce the 10/90 gap.

Gregor Wolbring is a member of the Executive of the Canadian Commission for UNESCO, a Biochemist at the University of Calgary, an Adjunct Assistant Professor for bioethical issues at the University of Calgary, Canada and University of Alberta, Canada and a consultant for bioethics, disability and governance of science and technology issues.

References

Allotey P, Reidpath D, Kouame A, Cummins R. 2003. The DALY, context and the determinants of the severity of disease: an exploratory comparison of paraplegia in Australia and Cameroon. Soc Sci Med. 57(5):949-58.

Club of Amsterdam, 2004. NanoWater conference, 27th Sept. 2004. See: http://www.clubofamsterdam.com/press.asp?contentid=267&catid=85

Elwan, A. 1999. Poverty and Disability: A Survey of the Literature. Available at: http://siteresources.worldbank.org/DISABILITY/Resources/ Poverty/Poverty_and_Disability_A_Survey_of_the_Literature.pdf

Global Forum for Health Research, 2004. The 10/90 Report, 2003-2004. Global Forum for Health Research, Geneva.

Groce, NE. 2003. Adolescents and Youth with Disability: Issues and Challenges. Available at: http://wbln0018.worldbank.org/HDNet/ HDdocs.nsf/View+to+Link+WebPages/644BB88B562E794D85256DCC0 0672C26?OpenDocument

Health Canada. 2004. Health Canada's 12 determinants of health. Available at: http://www.hcsc.gc.ca/hppb/phdd/determinants/index.html# key_determinants http://www.umanitoba.ca/centres/mchp/concept/hlth_ determ_table.html; http://www.hcsc.gc.ca/hppb/phdd/overview_ implications/01_overview.html;

Jakarta Declaration on Leading Health Promotion into the 21st Century. 1997. Available at: http://www.who.int/hpr/NPH/docs/jakarta_ declaration_en.pdf

Wolbring, G. 2004. Disability rights approach to genetic discrimination in J. Sandor, ed., Society and Genetic Information: Codes and Laws in the Genetic Era (CPS books Central European University Press, ISBN: 963924175X.

Wolfensohn, JD. 2002. Poor, Disabled and Shut Out. Washington Post December 3, 2002. Available at:http://www.globalpolicy.org/socecon/ develop/2002/1203disabled.htm

Worldenable. 2004. Comprehensive and integral international convention to promote and protect the rights of persons with disabilities. Available at: http://www.worldenable.net/rights/

World Health Organization. 2004. Disability, including management and rehabilitation. WHO Executive Board document EB114/4; Provisional agenda item 4.2, April 8th 2004. World Health Organization, Geneva.

Oklahoma State Board Of Health, 2004. State of the State's Health 2004. Available at:http://www.health.state.ok.us/board/ir03/burden.html

Ethics and health research for development: an essential combination



Article by Carel IJsselmuiden

thics attempts to distinguish between 'right and wrong' to guide human behaviour especially in situations without precedent for correct action. Health research virtually always concerns new and unprecedented actions and interventions, and thus ethical reflection should be prominent. Yet this has not always been the case: the systematic development of the ethical review of health research is relatively recent, as is the realisation that health research imperatives cannot simply override human rights. ethical principles and, in the context of this paper, other development goals.

The forced medical experimentation on prisoners by Nazi doctors during the Second World War gave rise to the first formal guide for ethical health research. Notably the denial of the right of individuals to decide on their participation in experiments, the conduct of experiments without an adequate scientific basis, and the exposure of individuals to risks that far outweigh any potential benefits that could come from these experiments formed the core of the Nuremberg Code (Nuremberg Code, 1948; Angell, 1990).

Medical research practice, however, needed another 16 years to develop a more user-oriented set of principles for the ethical conduct of health research: the Declaration of Helsinki was published by the World Medical Association in 1964 (World Medical Association, 2004). It took a further exposé of serious ethical problems in 22 studies conducted in the United States in 1966 for the ethical review of health research to become substantive, influential and mandatory (Beecher, 1966). Since then, the United States, public research sector has spearheaded the development of ethical review guidelines, processes and procedures, and has made a major contribution to facilitating ethical review of health research by developing a set of relatively simply to apply 'ethical principles' for the review of research involving human subjects (Belmont Report, 1979). This was followed by an internationalisation of ethical guidelines by the Council for International Organisations of Medical Sciences (CIOMS,

In brief, the ethical review of health research started as a means to protect research participants against abuse by research, researchers, or research sponsors. This remains a primary role (Emanuel, 2000) - perhaps even more so now, given the massive increases in potential financial gain and other benefits for health researchers, research sponsors, and

From the 1980s, ethical review focused more on the fair distribution of the benefits of health research, largely due to AIDS activism that demanded that the normal phased routines of drug trials be omitted to ensure that persons living with HIV/AIDS would have earlier access to potentially beneficial drugs. This was reinforced in the 1990s, when the potential benefits from international health research for local health workers, health services, patients outside the trials, and for local economics became more explicit. Finally, the massive increase in private - for profit - pharmaceutical, biotechnology and genetic research in developing countries since the 1990s have spurned global interest in current and future benefits to communities and individuals participating and providing biological specimens. The second role of ethical review of health research then centre on the fair distribution and maximisation of the benefits of health research, and it is this 'distributive justice' role of health research ethics which has the most direct impact on the relation between health research on development.

Ethics and health research for development

Health research ethics, or rather its application by Ethics Review Committees, has mostly concerned itself with risks and benefits to individuals in the context of specific studies. Indeed, most guidelines and procedures deal with these aspects (Levine, 1998). Yet, in the context of health research as a support to achieving the Millennium Development Goals (MDGs), there are many other considerations that place ethics and ethical review at the heart of the contribution that health research can make to development and poverty alleviation:

Ethical research strengthens individual and collective autonomy. Development starts with individuals, and with increasing 'self-esteem' or - in an economic context -'freedom' to achieve individual aspirations (Sen, 1999). Plans for global agendas ultimately need to consider their common end point: the individuals making up families, cities, countries, continents and the global population. Without an adequate basis of confidence and abilities of individuals and groups, other modalities of development can become unsustainable stop-gaps. Education, for

example, flourishes in an environment where individuals and communities can translate learning into action, but has little impact where circumstances prevent this.

The most developed principle in research ethics deals, in a different way, with this very same issue: the principle of 'autonomy' or 'respect for persons' highlights the right of individuals to be autonomous in deciding whether or not to participate in research, and, consequently, the principles imply a duty of health researchers to enable participants to make such choices as autonomously as possible. Ethical health research in developing countries can, therefore, contribute substantially to the knowledge, autonomy, and self-worth of participants, their families and communities. Taken together, if all health research globally spends sufficient time and efforts on maximising the autonomy of study participants, even if only by ensuring proper informed consent of individuals, families, communities, researchers, and even governments, then it can and does contribute importantly to this foundation of poverty alleviation and sustainability of development.

- Building ethical review capacity can enhance the responsiveness of health research to national health priorities. To enable developing countries to become partners in research, capacity building in the ethical review of research proposals and for the oversight of actual research is essential. Mostly, this is argued from the point of view of requiring 'local ethical review capacity' to speed up internationally funded research. (Berkley, 2003). The benefits are not only equality in partnerships, but also the potential of finding locally appropriate solutions to ethical dilemmas that may otherwise not have been obvious. Increasing emphasis on communal responsibility and benefits, for example, are challenging the more individually focused research ethics developed in the north. In addition, through the creation of local ethical review capacity, researchers - both foreign and national - are gradually becoming more accountable to local oversight, local health and research priorities, and community advisory committees, and, in this way, enhance a culture of democracy and transparency.
- Good ethical review of health research results encourage human rights. Ethical review of health research results sometimes – in actions that are contrary to local custom and norms. In as far as such conflicting actions challenge unacceptable practices, ethical review can encourage a culture of respect for human rights. For example, it is often argued that ethical review of research should be conducted in a 'culturally sensitive' manner, in other words, respecting decision-making and hierarchical structures. Yet, in many countries, the social and economic relationships between men and women result in biased power and decision-making capacity. In the context of ethical review, respecting local customs may, therefore, constitute an endorsement of oppressive gender relations. By insisting on a universal application of the principle of 'respect for persons', for example, ethical

- review can assist in enhancing the status of women, children, aged and ethnic minorities if done with care.
- Ethical review can increase post-trial benefits for developing country populations. The ethical principles of 'beneficence' and 'distributive justice' are the major drivers behind current discussions on 'post-trial benefits'. The discussion on 'post-trial benefits' is often limited to discussing the making available of treatments that are found to be effective in research to study participants. However, 'pre-, intra- and post-trial benefits' are also to be considered beyond what is available to the individual study participants. To be able to conduct health research in developing countries, research sponsors often need to invest in human resource development (training of health staff, researchers, field interviewers, counsellors, etc), in equipment and facilities, in transport, and sometimes in infrastructural improvements. These constitute clear benefits to communities, and, indeed, for some communities the economic benefits of research become the prime justification of research. Given the massive increase in research spending in developing countries pharmaceutical trials in developing countries alone are estimated to be worth over 3 billion US\$ in 2000 adequate consideration of the 'communal benefits' of health research by Research Ethics Committees can make a meaningful difference in the lives of many people in otherwise economically underdeveloped areas.
- Capacity building in ethics is essential as part of strengthening national health research systems: the mechanisms by which countries can prioritise health research and manage scarce - internal and external health research resources for optimum impact on population health. If capacity building in ethical review and oversight is understood comprehensively, it also includes enabling institutions and governments to negotiate with research sponsors. For example, when a research sponsor specifies a priori that post-research provision of effective treatment is not part of their budget (as many are actually doing at this time), then governments and institutions need to decide whether or not it is ethical to accept such restrictive conditions. If it is deemed ethically problematic, then further negotiations with researchers or research sponsors may lead to more ethical outcomes. Such considerations and negotiations are complex, and its inclusion in ethics capacity building programmes is likely to be beneficial to other complex governmental and institutional processes as well.
- ♣ Finally, good research ethics is a pre-requisite for continued willingness of populations in developing countries to continue participating in health research. The abuse of power by researchers, research sponsors, or by governments of research participants who are often illiterate and relatively low on the power hierarchy will ultimately lead to serious obstacles to conducting legitimate and necessary research. The Tuskegee study of

syphilis in African-Americans that denied participants effective treatment when it became available (Jones, 1993), has led to great suspicion about any further research in this community (El-Sadr, 1992). Recent halting of HIV/AIDS vaccine trials in Thailand and Cambodia underline the dangers of not spending sufficient time and effort in ensuring good ethical practice and in communicating this to partners in developing countries to elicit their effective support. (Chase, 2004; New Scotsman, 2004). Improved communication ensures that abuses in one part of the world are rapidly understood in other parts of the world, and taking ethical 'shortcuts' in developing countries is putting the ability to conduct future health research in those countries, even in other continents, at serious risk.

Current controversies in health research ethics

From the time Beecher published his article outlining serious ethical concerns in over 22 studies reviewed, there has been a major effort, especially in the United States, to build individual, institutional, and national capacity ensuring good ethical practices. European countries have lagged for some decades but are now becoming more aware of the need to invest in building ethical review capacity.

Developing countries themselves have not invested substantially in the ethical review of health research. However, in some larger countries and those where there is a concentration of internationally funded health research, governmental committees have been established that provide some measure of control and oversight for health research conducted in these countries. Such bodies do not, however, provide the ability to conduct independent ethical review.

Driven by the increasing amount of international health research, initially around HIV/AIDS but now expanding to many other conditions, the NIH spearheaded a programme of building ethics review capacity in developing countries through its Fogarty International Program (JAMA, 2002). Since then, some others have followed this example, and there are now over 20 active research ethics training and planning programmes located in Africa, Asia and Latin America. While insufficient to deal with the increase in health research, such programmes are a meaningful part of capacity building in health research. (Berkley, 2003)

There are still many active debates in the field of research ethics, some of which are more technical and not of direct relevance to population health and to development. Below is an outline of some of the controversies that may have a direct impact on health, development, and the effects of poverty... at least for a small but growing number of people.

Standard of care

In clinical trials of new drugs, it is customary to test the new drug (the experimental group) against an existing treatment (the control group). In fact, the Declaration of Helsinki (paragraph 29) (World Medical Association, 2004) makes it mandatory that the control group in trials receives the 'best proven' treatment, as it is considered unethical to provide treatment of which it is known that it

is 'sub-optimal'. In the context of research in developing countries, however, it is argued that 'best proven' treatment is inappropriate as people will not normally have access to such treatment in any case. It is proposed to replace 'best proven' with 'best available' treatment, which would be less onerous for researchers and research sponsors. Even that is not often complied with (Kent, 2004) Besides non-compliance, there is a risk that this (weakened) interpretation creates a situation in which the economic situation of developing countries and populations becomes a justification to conduct research that can no longer be conducted in developed countries. A benefit of retaining 'best proven' treatment, on the other hand, is that standards and treatments are set at higher levels, challenging local services to enhanced performance and making available to participants treatment otherwise not accessible to most.

Post-trial benefits

If a study is done on a new treatment, and this treatment is found to be effective, is it reasonable for the researchers or research sponsor to then simply stop providing this treatment as soon as 'proof' is obtained? Many feel that this would be unethical, especially if it concerns 'lifesaving' treatment, and they are supported in this opinion by the Declaration of Helsinki (paragraph 30). (World Medical Association, 2004; Ananworanich 2004) Yet, there is a challenge from research sponsors and pharmaceutical industry: literal interpretation of this clause could make any health research prohibitively expensive to the extent that it would inhibit future health research (Cohen, 2004). For this reason, for example, the US Federal Drug Administration is proposing to remove the Declaration of Helsinki from its list of recommended documents, while other regulators and research sponsors specify up front not to provide funding for post-trial treatment, leaving open by whom and how this should be done (Koski, 2001; Lurie, 2004). The debate is ongoing, however, and there is likely to remain a polarisation for now (Schuklenk, 2004)

Research on drugs and technologies that are not affordable in the countries where the research is being conducted.

Is it ethical to conduct clinical research on drugs, for example, that are not unlikely to be made available through the health services of the country where the research is being conducted? (NBAC, 2001) Is the capacity building, infusion of research funds, potential reduction of 'brain drain' and speed of obtaining results through such research sufficient argument to conduct research in populations that will not be able to afford the drug even if it is found to be effective? Many find that this would constitute unethical practice and a form of exploitation of populations who do not have the power to decline. On the other hand, the sheer magnitude of funds available for pharmaceutical research in developing countries is such that it can potentially make a major contribution to development of the national health

research system. The discussion is ongoing and may, clearly, have significant implications not just for researchers but also for potential participants and their families and communities.

- Development versus 'urgency and efficiency'. As is often the case in health research, the 'urgency' argument for medical research is used to justify 'ethical short-cuts'. Given the current financial interests in pharmaceutical research, the 'efficiency' argument is added for increased impetus. From various sides, attempts are made to reduce over-regulation and unnecessary administrative loading of researchers and ethics committees alike. (Jamrozik, 2004). There is in addition perhaps an over-cautionary approach when dealing with international health research given past abuses. (Gilman, 2004). However, while there is reason in simplifying for efficiency, there is a serious tension between international attempts to harmonise ethical guidelines for the ethical review in multi-centre trials taking place in different countries (ICH 1996) on the one hand, and the nascent capacity of country and institutions ethics review committees in developing countries on the other hand. The ability to deal with research responsibly in countries is a great step towards autonomy and general development and should surely receive precedence over efficiency.
- Ethics capacity strengthening: an essential research investment in developing countries. In spite of an increasing interest in promoting ethics as key component of health research, funding for capacity building in this field is relatively scarce, and most research sponsors do not provide funds for this purpose. Even large multinational programmes like the European Developing Country Clinical Trials programme (EDCTP) with a nominal value of over 300 million Euros at its launch, had not considered ethical review capacity building as part of its mandate, and has added a small component almost as an afterthought. (EDCTP 2004). Although there are over many new training programmes. there are still many countries without national capacity to review research proposals, and all health research

funded internationally should include contributions to building this national capacity.

Health research conducted in developing countries should not be seen exclusively as 'health research for disease control' but also as a building block to overall development. In many low and lower-middle income countries, the external health research budget makes up the largest investment in a country's science and technology budget, and it would be wasteful to ignore this wider context in which health research takes place. If health research is more than research for disease control - in other words as health research for development - then ethical review and oversight of health research becomes central to the role that health research can play in the overall development of poor countries. Ethics review and ethics review capacity strengthening should be a routine part of any research proposal and research sponsor's budget for research just like provision is made for statistical consultations, equipment, and personnel!

Carel B IJsselmuiden is a public health physician and epidemiologist who has worked in rural and urban public health services in South Africa since 1980. Dr IJsselmuiden was appointed in 1995 as Professor and Head of the Department of Community Health at the University of Pretoria, and became the Founding Director of the School of Health Systems and Public Health at the same university in 1999. In January 2004, he took up the post of Director of the Council on Health Research for Development (COHRED) and is currently based in Geneva. Besides public health education and practice, he has extensive experience in health research ethics in Africa, and was awarded a full training grant from the Fogarty International Center of the National Institutes of Health (NIH) for Master's level research ethics training in Africa in 2003, and became principal investigator of what is now known as SARETI, the South African Research Ethics Training Initiative. He has written extensively in the field of research ethics in Africa. He remains involved in SARETI, is consultant to HAVEG - the HIV/AIDS Vaccine Ethics Group and Adjunct Professor at the University of Kwazulu-Natal, Extraordinary Professor at the University of Pretoria, and teaches a research ethics course at the University of Kwazulu-Natal and at the Makerere University Institute of Public Health in Uganda.

References

Ananworanich J, Cheunyam T, Teeratakulpisarn S, et al. 'Creation of a drug fund for post-clinical trial access to antiretrovirals.' Lancet 2004; 364: 101-02.

Angell M, 1990. 'The Nazi hypothermia experiments and unethical research today.' New England Journal of Medicine 1990; 322: 1463-4.

Beecher HK, 1966. 'Ethics and clinical research.' New England Journal of Medicine 1966: 274: 1354-60.

Belmont Report, 1979. National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979. The Belmont Report. Ethical Principles and Guidelines for the Protection of Human Subjects of Research. Accessed through: http://ohsr.od.nih.gov/guidelines/ belmont.html (accessed 20 September 2004)

Berkley S, 2003. 'Thorny issues in the ethics of AIDS vaccine trials.' Lancet 2003: 362: 992.

Cohen J, 2004. Aids research: drug trials without the drugs?, Science 2003 300: 1212-1213. Accessed through: SciDevNet http://www.aidscience.com/Science/Cohen300(5623)1212.html. (Accessed 20 September 2004).

Chase M, Naik Gautam. 'Key AIDS Study In Cambodia Now in Jeopardy.' Staff Reporters of The Wall Street Journal, August 12, 2004; Page B1.

Council for International Organisations of Medical Sciences (CIOMS), 1993, revised 2002. International Ethical Guidelines for Biomedical Research Involving Human Subjects. Geneva, 2002. Accessed through: http://www. cioms.ch/frame_guidelines_nov_2002.htm (accessed 20 September 2004).

References continued

EDCTP. European & Developing Countries Clinical Trials Partnership, 2004. Accessed through: http://www.edctp.org/21_about_mission.htm. (Accessed 20 September 2004).

El-Sadr W, Capps L, 1992. 'The challenge of minority recruitment in clinical trials for AIDS.' Journal of the American Medical Association 267:

Emanuel EJ, Wendler D, Grady C, 2000, 'What makes research ethical?' Journal of the American Medical Association 283: 2701-11.

Gilman RH, Garcia HH, 2004. 'Ethics review procedures for research in developing countries: a basic presumption of guilt.' Canadian Medical Association Journal 171: 248-9.

ICH. International Conference on Harmonisation, 1996. Guidance for Industry: E6 Good Clinical Practice: Consolidated Guidance. April 1996. Accessible through: www.fda.gov/cder/guidance/959fnl.pdf. (Accessed 20 September 2004)

JAMA, 2002. 'World Health Focus of Fogarty International Center.' Journal of the American Medical Association 287: 2063-4.

Jamrozik K, 2004. 'Research ethics paperwork: what is the plot we seem to have lost? BMJ;329:286-7

Jones JH, 1993. 'Bad Blood. The Tuskegee syphilis experiment.' The Free Press, New York. 2nd Ed.

Kent DM, Mkaya Mwamburi D, Bennish ML, Kupelnick B, Ioannidis JPA, 2004. 'Clinical Trials in Sub-Saharan Africa and Established Standards of Care A Systematic Review of HIV, Tuberculosis, and Malaria Trials.' Journal of the American Medical Association 292:237-42.

Koski G, Nightingale SL, 2001. 'Research Involving Human Subjects in Developing Countries.' New England Journal of Medicine 345:136-8.

Levine R, 1998. Ethics and Regulation of Clinical Research. Yale University Press, New Haven and London.

Lurie P, Wolfe SM, 2004. Open letter to FDA. - Re: Docket No. 2004N-0018: Human Subject Protection; Foreign Clinical Studies not Conducted Under an Investigational New Drug Application. 1 September 2004. Public Citizen's Health Research Group. Washington.

Additional comment on same topic: For those interested in global research ethics, and in the continued tension between different documents (such as ICH and the Declaration of Helsinki), the FDA has posted a public notice of the intent to remove the Declaration of Helsinki in favor of the ICH GCP guidelines as a requirement for foreign drug studies not conducted under an IND. See Docket No. 2004N-0018, CDER 2002146. Human Subject Protection; Foreign Clinical Studies Not Conducted Under an Investigational New Drug Application. Pages 32467 -32475 [FR Doc. 04-13063] See http://www.fda.gov/OHRMS/DOCKETS/98fr/04-13063.pdf for the notice.

NBAC, 2001. National Bioethics Advisory Committee. Ethical and Policy Issues in International Research: Clinical Trials in Developing Countries. Accessed through: http://www.georgetown.edu/research/nrcbl/nbac/ pubs.html.(Accessed 20 September 2004)

New Scotsman, Thurs 15 Jul 2004, Prostitutes 'Exploited' in Aids Drug Experiments. Accessed through http://news.scotsman.com/latest.cfm (accessed July 15th 2004)

Schuklenk U, 2004. 'The standard of care debate: against the myth of an international consensus opinion'. Journal of Medical Ethics 30:194-197.

Nuremberg Code, 1948. Published in: Trials of War Criminals before the Nuremberg Military Tribunals under Control Council Law No. 10, Vol. 2, pp. 181-182.. Washington, D.C.: U.S. Government Printing Office, 1949. Accessed through: http://ohsr.od.nih.gov/guidelines/nuremberg.html (accessed 20 September 2004).

Sen, A, 1999. Development as freedom. Oxford University Press, Oxford.

World Medical Association, 2004. Declaration of Helsinki, 1964. Accessed through: http://www.wma.net/e/policy/b3.htm (accessed 20 September 2004)

Implementing health research

- 148 Health research priority setting and tracking financial resources Andres de Francisco, Abdul Ghaffar and Mary Anne Burke
- 152 Advancing healthcare through ehealth technology Sponsor's statement: Microsoft
- 155 Globalising innovation in healthcare technology Harvey E Bale
- 158 HIV/AIDS Time is of the essence...

 Sponsor's statement: DHL
- **161** The role of public-private partnerships in health research for development **Roy Widdus**
- 165 New drugs for neglected diseases: what will it take? Bernard Pécoul
- 169 A role for schools of public health in development Barry R Bloom
- 177 Capturing biotechnology's promise for developing world diseases Wendy Taylor

Health research priority setting and tracking financial resources



Article by Andres de Francisco (pictured), Abdul Ghaffar and Mary Anne Burke

ealth is now increasingly seen as a product of development and as a vital contributor to the development process (Global Forum for Health Research, 2004). Investments in health play a key role in economic and social development. The long term nature of health research and its application require a continuous effort for it to bear the products which can have an impact on health. In spite of their high potential rates of return, investments in health in developing countries, both public and private, are desperately low as compared to an amount of US\$30-40 that is considered by the Commission on Macroeconomics and Health to be the absolute minimum level of health spending necessary to cover essential interventions (Commission on Macroeconomics and Health, 2001).

Health research is essential to improve health programmes and services. Yet, funds for health research are limited and are frequently the first item to be cut out from budgets in lean times. Policy makers and researchers have argued for support for health research by identifying areas in which it is likely to make a difference. Priorities for health research need to be identified if arguments for obtaining financing are to be successful. However, the application of the results of health research is often not taken into consideration when embarking on research projects.

Health research plays a crucial role to ensure that the limited amounts invested in health each year are used in the most efficient, effective and equitable way. Health research is often equated only to the development of medicines and vaccines. In fact, it encompasses more than that - it spans from basic research, through clinical research, operational research, social sciences research and policy-related research. One such application, related to priority setting, is the measurement of health disparities among the population and the estimation of the impact of potential interventions. This can be assisted by estimating the extent of global health inequities using the global burden of ill health.

The burden of ill health

Measurement of the degree of morbidity and mortality in a given population provides an assessment of the disease burden. Using evidence-based information to derive a quantitative measurement of health status, these measures incorporate information from public health branches of quantitative disciplines, including epidemiology and demography, amongst others. One of these types of summary measure, Disability Adjusted Life Years (DALYs), has been used to measure the global burden of disease (Murray and Lopez, 1996). One DALY represents the burden produced by a certain condition/disease defined as the sum of two components: years lived with disability and years of life lost from premature death. Current understandings about what constitutes a disability and what individuals with a disability have to contribute to society challenge the research community to refine this measure. Nonetheless, DALYs are widely used, and are an important contribution to the task of estimating the outcomes of disease.

Information for 2002 indicates that about 1.5 billion DALYs affected the 6.2 billion people living in the world (World Health Organization, 2004). With 78% of the world's population, developing countries account for approximately 86% of the total world's burden of diseases. Of these diseases, communicable diseases such as HIV/AIDS, pneumonia, malaria and tuberculosis, occur at rates that are nine times higher in developing than in developed countries. Death and disability due to violence and injuries is almost two times higher in developing than in developed countries. Noncommunicable diseases, such as cardio-vascular diseases, neuropsychiatric conditions and cancer, have a similar prevalence in developing and developed countries. Maternal and perinatal conditions, which invariably require recognition of early danger symptoms at home, transportation of people at risk, and infrastructure and manpower in health systems to deal with complications, have a ten fold higher rate in developing countries than in developed countries. Maternal deaths can be a thousand times higher in least developed countries when compared with highly developed ones.

Other measurements of equity

Disease burden is the result of factors which lead to it. Selected cross-cutting issues related to disease burden deserve attention in priority setting and the elimination of health inequities. These include poverty, gender disparities, disability, health systems malfunction and lack of research

Breaking out of the health crisis requires breaking out of the

The development of tools against major diseases of developing countries requires efforts by both public and private sectors

vicious circle of poverty and inequity. Further, unless biases based on gender, ability, race, social class and other social hierarchies are eliminated, and biological differences are acknowledged and taken into account, health inequities will persist. There has been little focus on the overall performance of health policy and health systems in the past, in particular in developing countries. In addition, developing countries require renewed and intensified efforts to develop appropriate indigenous research capacity.

The development of tools against major diseases of developing countries requires efforts by both public and private sectors. Increased effectiveness of public-private collaborations is likely to stimulate financing for R&D on neglected diseases and to improve access to health products.

The role of health research

Health research is defined here very broadly to encompass all research activities from basic research to policy and operational research. The need for health research does not end with the development of a new medicine, but continues until people's health actually improves in a measurable way. Health research plays a crucial role to ensure that the limited amounts invested in health each year are used in the most efficient, effective and equitable way. Access to the products of research should be part of the research question.

Health research is a global public good. What can be the role of health research in addressing health inequities? First of all, the documentation of these disparities and inequities is important. Further, research contributes to health system development and the implementation of health strategies by identifying (i) health determinants, which lead to health problems; (ii) interventions which are most effective to reduce

Potential roles of health research in poverty alleviation and health improvement

- Identify health inequities.
- Document disease burden, interaction of determinants and risk factors, and propose interventions for their reduction.
- Identify deficiencies in health systems that hamper the delivery of and demand for health services for the poor.
- Design effective products (medicines, vaccines, diagnostic tools) for conditions affecting poor populations, in particular for neglected conditions.
- Describe the ability of the populations suffering health conditions to access research results and identify gaps.
- Understand and describe health-related pathways to assist people out of poverty.

the determinants (taking cost into account), and (iii) identification of target groups who will benefit the most.

Social sciences research is key to the identification of problems and appropriate interventions by involving communities from the beginning of the process. Studies have reported the success of initiatives implemented at the home level to detect danger signs of specific conditions such as in the case of pneumonia and pregnancy complications. Most pneumonia and maternal deaths in developing countries occur at home. If a child with pneumonia, or a mother with a delivery complications, is not being identified as having a danger sign at home, it is unlikely that they will be taken to a health facility or referred to a higher healthcare level. Health research cannot be limited to the development of tools and medicines in scenarios where diseases are not detected by those who are suffering them.

Priority setting: examples of experience

In view of the competing priorities for health research funds, priority setting in health research is as critical as conducting the research itself. Priority setting aims to make the process of

	Total	Individual, household and community	Health ministry and other health institutions	Sectors other than health	Macro-economic policies
1. Disease burden*					
2. Determinants					
3. Present level of knowledge					
4. Cost and effectiveness					
5. Resource flows**					
* Global total estimated at US\$1.5 billio ** Global total estimated at US\$105.3 b					<u> </u>

At the country level, the Combined Approach Matrix was used in Pakistan to assist the Government to assess potential research priorities in perinatal and neonatal care, widely acknowledged to be a greatly underresearched and under-resourced area, and in India through the Indian Medical Research Council to identify key research priority areas

selection of research areas more transparent and, through this process, to provide decision-makers with solid information on which to base their decisions.

Efforts on priority setting have been undertaken since the early 1990s. The Commission on Health Research for Development recommended the establishment in each developing country of an appropriate health research and priority setting base, called 'Essential National Health Research (ENHR)' (Commission on Health Research for Development, 1990), a concept further developed by the Council on Health Research for Development (COHRED) since 1994. The WHO Ad-Hoc Committee on Health Research continued the effort in the development of a methodology for prioritization of health research and proposed the 'five-step process' as a basis for identifying the top priorities in international health research (WHO Ad-Hoc Committee on Health Research, 1996). A further contribution was made by the WHO Advisory Committee on Health Research in 1997 with the development of a 'Visual Health Information Profile'

The Global Forum for Health Research combined the most important characteristics of these various methodologies into the 'Combined Approach Matrix' as a tool for the identification of gaps and priorities in health research (Global Forum for Health Research, 2004a). The resulting matrix (Figure 1) combines elements of disease burden, effectiveness and resource flows with interventions at the household and community levels, health sector and sectors other than health, thereby exposing gaps in health research. The Combined Approach Matrix has been used at the global and country level. Recent examples of its use include the WHO Tropical Diseases Research (TDR) programme, which used and subsequently modified this tool to help in their selection of research priorities. It has been applied by multiple partners on the identification of a research agenda on indoor air pollution research.

At the country level, the Combined Approach Matrix was used in Pakistan to assist the Government to assess potential research priorities in perinatal and neonatal care, widely acknowledged to be a greatly under-researched and under-resourced area, and in India through the Indian Medical Research Council to identify key research priority areas.

We are currently undertaking studies to demonstrate the utility of the Combined Approach Matrix in exposing gender disparities within health research gap identification for HIV/AIDS and safe motherhood research.

Results from the applications made indicate that the Combined Approach Matrix brings together in a systematic framework all information (current knowledge) related to a particular disease or risk factor, identifies gaps in knowledge and future challenges, and permits the identification of 'common factors' by looking across the diseases or risk factors – taking into account the large number of factors outside the health sector that have an important impact on people's health. In sum, the Combined Applied Matrix is applicable to identify gaps in health research on diseases and risk factors in the national, regional or global health domains.

Financial flows: overview of past and current efforts

Tracking financial flows provides one measure of the level of effort and intensity of health research. The Commission on Health Research for Development (1990) evaluated the distribution of resources for health research and development (R&D) in relation to the purpose of the R&D. This evaluation highlighted the gross mismatch between health needs in developing countries and the R&D financial resources devoted to them. This was later referred to as the 10/90 gap reflecting the Commission's estimate that less than 10% of health research was devoted to 90% of the world's health problems.

This imbalance was considered to result from:

- a failure of the public sector in developed countries to allocate health research funding on the basis of health problems at the global level;
- a limited capacity for research and utilisation of research results in the public sector in developing countries; and
- the limited research on neglected diseases undertaken by the private sector due to projected lack of commercial returns.

Systematic measurement of investments in health research is relatively recent. It was estimated (Global Forum for Health Research, 2001) that global investments in health research amounted to US\$73.5 billion in 1998 (50% by national governments, mostly from advanced and transition countries, 42% by the pharmaceutical industry and 8% by private non-profit organisations). Funding for health research has, in general, increased in recent years. An update of estimates is

Today, millions of individuals do not have access to cost-effective, proven tools to improve their health. There is now concern that the MDGs will not be achieved by the target date of 2015

being undertaken at present (Global Forum for Health Research, forthcoming publication). Preliminary figures indicate that, for 2002, total investments in health research from both private and public sources were above US\$100 billion. Preliminary analysis indicates that most of the funds are allocated by developed countries, of which 44% is allocated by the public sector and 56% from the private (profit and not-for-profit) sector. Of the combined public and private funds, 4% are allocated by developing countries. Hopeful signs are emerging as neglected diseases are receiving funds either from new funding sources or from reallocations of existing funds. Public private partnerships for product

development are emerging as an important strategy to support research for neglected diseases.

Conclusions and further considerations

The improvements in health status seen throughout the past centuries were, in part, possible due to a technological revolution, with research acting as a driver of innovation and development. Yet a large proportion of the world's population has failed to derive substantial benefit from the fruits of this research.

Today, millions of individuals do not have access to costeffective, proven tools to improve their health. There is now concern that the MDGs will not be achieved by the target date of 2015. While health research is a global public good, and it should be seen as such, the results of its findings are not necessarily applied worldwide for a series of reasons. While it is expected that research on medicines, diagnostic facilities, treatments or preventive activities will in due course benefit the world as a whole, there is frequently a missing link between the development of products and tools and the implementation and distribution of research results. Given the different levels of access, infrastructure and manpower between countries, analysis of the transferability of research results to specific environments needs to be undertaken. The benefits of curative models for certain conditions need to be balanced against a preventive, primary health care model, and their costs and effectiveness measured. The ultimate goal is to ensure the highest possible level of health to a population for a given investment. Priority setting in health research can help in this process by focusing research on issues of equity, access and distribution of research results.

Andres de Francisco, Deputy Executive Director of the Global Forum for Health Research, is a public health specialist with extensive experience in assessing the impact of health programme interventions.

Abdul Ghaffar is a public health physician working with the Global Forum for Health Research as a Health Policy and Systems

Mary Anne Burke is a specialist on sociology and demographic analysis and is working as a Policy Analyst/Statistician with the Global Forum for Health Research.

References

Commission on Health Research for Development, 1990. Health Research, Essential Link to Equity in Development. Commission on Health Research for Development, Geneva. Available at: www.cohred.org

Commission on Macroeconomics and Health, 2001. Macroeconomics and Health: Investing in Health for Economic Development, Report of the Commission on Macroeconomics and Health. World Health Organization, Geneva.

Global Forum for Health Research, 2001. Monitoring Financial Flows for Health Research. Global Forum for Health Research, Geneva. Available at: www.globalforumhealth.org

Global Forum for Health Research, 2004. The 10/90 Report on Health Research, 2003-2004. Global Forum for Health Research, Geneva.

Available at: www.globalforumhealth.org

Global Forum for Health Research, 2004a. The Combined Approach Matrix: A Priority-Setting Tool for Health Research. Global Forum for Health Research, Geneva. Available at: www.globalforumhealth.org

Murray CJ, and Lopez A. 1996. Global Burden of Diseases and Injuries, 1996. World Health Organization, Geneva, Volume 1.

WHO Ad-Hoc Committee on Health Research, Investing in Health Research and Development, World Health Organization, September 1996.

World Health Organization, 2004. The World Health Report, 2004: changing history. World Health Organization, Geneva.

Advancing healthcare through ehealth technology

Microsoft[®]

n recent times it has become evident that there is a need for improvement in a number of key areas affecting the World's respective healthcare systems, e.g.: health research, administrative overload, waiting lists for treatment, quality shortcomings, and spiralling costs, to name a few. If we expect to see a substantial improvement in quality and delivery in the coming years, we can also expect that information technology (IT) will play a central role in their transformation and redefinition. Moreover, information technology itself is gradually becoming a major enabling tool in the development of health research and healthcare systems. It can make a positive difference in research to achieve the health-related Millennium Development Goals and will help to close the 10/90 gap in health research.

Doctors' surgeries, clinics, hospitals and often insurance companies, are the core of healthcare delivery systems. Provider organisations are required to share information amongst each other as well as with patients, insurers, employers, pharmaceutical companies and government agencies. However, inter and intra-organisational communication between healthcare providers is often difficult because of the non-compatibility of their legacy, mainframe information systems and the fact that many physicians still use paper-based systems.

Often basic information such as patient medications, laboratory results, allergies and family histories are not available during the first consultation with a doctor especially in poorer countries where any written records may not even be transmissible by fax or email. Physicians require complete and easily accessible patient information because it directly affects the delivery of 80% of healthcare services such as making diagnoses, ordering tests and treating patients. The key to improving the quality and widening the availability of healthcare while reducing costs to the point of care, wherever it may be, is to provide physicians with the information they need at the time of a patient's visit.

Hospitals and surgeries are information-filled environments,

Physicians require complete and easily accessible patient information because they directly affect the delivery of 80% of healthcare services through making diagnoses, ordering tests and treating patients

so much so that what were once administrative back-up systems have become invaluable assets, enabling surgeons and doctors to rapidly identify, or verify remotely, specific disease or injury characteristics and make critical life and death decisions quickly and more accurately than before. Substantial benefits can be achieved by uniting information flows without the operational disruptions and expense of replacing legacy systems. All-important cost savings can

Mobility is also becoming increasingly important in healthcare management decisions. A doctor can have access to patient records and drug formularies and get instant notification and delivery of critical lab reports through a password-protected wireless device that can be carried in a pocket and immediately replaced through automated online backups should it be damaged or lost

emerge and healthcare providers can greatly enhance the ways in which they deliver care - to more people.

Mobility is also becoming increasingly important in healthcare management decisions. A doctor can have access to patient records and drug formularies and get instant notification and delivery of critical lab reports through a password-protected wireless device that can be carried in a pocket and immediately replaced through automated online backups should it be damaged or lost. Also the access to information is of enormous importance.

This technology also provides the cornerstone of patient empowerment by recording medical encounter information in an easy-to-present and understandable form. These tools allow data to be submitted by care givers such as pharmacists and physicians as well as consumers - wherever and whenever. Each data entry is logged by source so professional record information is distinct from consumer-entered information. The key enabler is a record system that uses the Internet and Web services to create and store information. A key attribute of this type of system is that it enables people to maintain access to their records. In this way, the system will allow users to grant access to a specific set of data only, or allow access on a one-time or limited-time basis or until access is revoked.

The healthcare market has the challenge of handling everincreasing demands and ever-increasing amounts of information. Today, much of this information in hospitals and in the provider organisations remains on paper. Contact between providers and patients still consist of letters, complex paper forms, phone calls and meetings. Simple questions such as 'What added value does the patient get?' are difficult to answer because the relevant information about patients and diseases is generally held in separate information and business silos spread across vertical systems (on the provider and payer side) and there is no simple way of obtaining a coherent view of that information without becoming involved in a resource-intensive or privacyproblematic process. Operationally this presents huge logistical and resource challenges to the healthcare system. To the patient it makes dealing with any sector of the healthcare arena a time- and money-consuming and unnecessarily complex process.

The overall target is clear: Focus on 'health' in the word ehealth. Technology is a powerful tool to assist in reaching the targets of health research and to achieve the Millennium Development Goals. We have to overcome the sectoral divide in healthcare and to concentrate on a process-oriented care delivery across the continuum of care. All over the world, IT can help to close the gap in health research.

Therefore, we are talking about transformation of the healthcare system. IT as a vehicle can support the healthcare professionals in meeting the new requirements of a modern healthcare system. Thus, a process-oriented transformation implies linking education, research, healthcare, and human

Microsoft follows a collaborative approach - together with strong and competent ISV and SI partners, we address the main challenges and requirements across the continuum of modern healthcare:

- Deliver the right information, at the right time to the right addressee.
- Be patient centred in order to preserve the best possible health state of sick persons.
- Support treatment and care processes in order to increase the quality of care.
- Overcome sectoral barriers between different levels of healthcare such as out-patient and in-patient care or different social systems such as healthcare and rehabilitation.
- Bring up efficiency and cut down cost.
- Foster ehealth research projects.

Our health is the highest value we have. Microsoft places the highest priority on partnership in the pursuit of the tasks ahead, in building an information society for all the world's patients and medical stakeholders so they may have the opportunity to realise their full potential.

To create future, it needs information technology from



Dr Joerg-Peter Schroeder Healthcare Solution Manager, EMEA

Responsibility

In Microsoft, Dr Schroeder leads the Healthcare business in the public sector in EMEA. Accountable for health-related projects and programmes, i.e. hospital-information-systems (HIS), mobility, ehealth, healthcare-portals, human services and healthcare leadership.

Biography

Before joining Microsoft he has worked more than 15 years in the IT-industry, insurance and hospital sector as well as for scientific institutes and LRG on strategic process-, quality-, project- and IT-management.

Dr Schroeder is a national member of the working group on health technology assessment and quality improvement of the IMIA (International Medical Informatics Association) and a member of the board of healthcare management at the INSEAD Business school in Fontainebleau, France,

Microsoft and its partners to enable caring people at all levels of healthcare to meet their requirements. \square

In Microsoft, Dr Schroeder leads the Healthcare business in the public sector in EMEA. He is accountable for health related projects and programmes, i.e. hospital-information-systems (HIS), mobility, ehealth, healthcare-portals, human services and healthcare leadership.

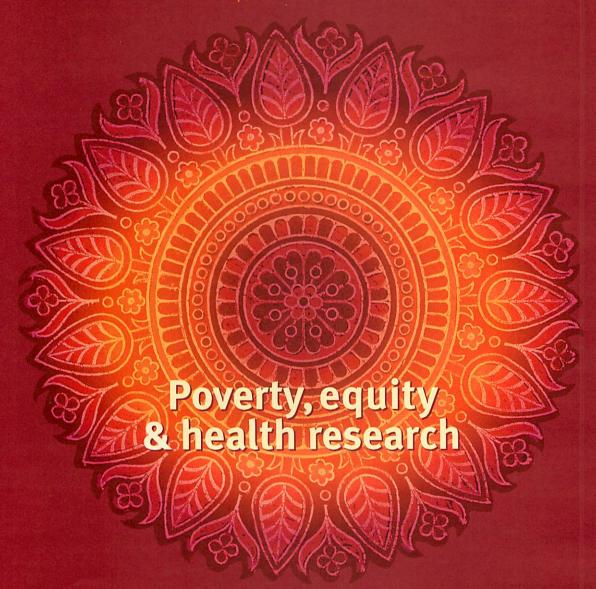
MICROSOFT

Healthcare Solution Manager EMEA Microsoft EMEA Headquarters

D-85716 Unterschleißheim

Global Forum for Health Research

HELPING CORRECT THE 10 90 GAP



Forum 9

12-16 September 2005

लपलिकां, गिर्वाव

www.globalforumhealth.org

Globalising innovation in healthcare technology



Article by Harvey E Bale

nnovation is the driving force for progress in healthcare goods and services. Leading-edge science and private sector competition have given birth to a revolution in new health technologies. Innovation begins with invention and depends on initiative, driven by incentives that engage the private sector in the pursuit of better health for as many people as possible. Health-related technology improvements led by the introduction of new medicines are estimated to have reduced human mortality by as much as 50% between 1960 and 1990. Both developed and developing regions have made progress in human development in the past 30 years and the number of people living in low human development countries has more than halved, from 1.1 billion in 1975 to 500 million in 1999. For example, the increased global immunisation coverage, reaching 80-90% of infants in the late 1990s, had a significant impact on the infant mortality rate, which dropped by 50% in least developed countries over last 25 years.

The role that health innovation plays in responding to the ever-changing profile of disease is even more critical today, as global demographic changes lead to older populations suffering from the twin burden of chronic non-communicable ailments and the rise of new infectious pathogens and growing resistance to established therapies. Figure 1 gives a partial look at the development pipeline of medicines currently in human clinical trials:

Pharmaceutical innovation

Pharmaceutical innovation is one key element for improvements in health, and health in turn is a powerful contributor to overall economic and social welfare. Furthermore, healthcare innovation is important to economic activity and adds value to a range of other technological applications, from information processing to manufacturing and materials management. In most industrialised countries, health care is the largest single sector of economic activity. This trend will accelerate as populations age and the demand for healthcare services increases. Only a few industrial sectors devote significant resources to research, and with few exceptions the R&D based pharmaceutical industry leads the way in terms of funds spent as a percentage of sales. In 2001, pharmaceutical companies accounted for 10% (US\$45 billion) of the US\$450 billion spent on R&D by private industry in the 30 OECD countries. In some countries,

such as Denmark and the United Kingdom, the share of the pharmaceutical industry in private R&D exceeds 20%.

Pharmaceutical innovation has had a positive impact on health as well as spurring related improvements in productivity and economic growth. The societal and individual benefits arising from effective drug treatment outweigh the monetary costs of the medicines themselves. Moreover, for millions of patients many diseases are now classified as chronic rather than life threatening due to advances in drug delivery and treatment.

New drug therapies have also allowed patients to continue to work and lead productive lives. A 1998 paper published by the US National Bureau for Economic Research found that the introduction of 'priority' drugs between 1970 and 1991 not only increased the mean age at death for the US patient population – it also raised lifetime income levels by about 0.75 to 1% per annum, representing a substantial additional contribution to economic growth.

The innovative pharmaceutical industry is a key element of the global knowledge economy. R&D-based pharmaceutical companies accounted for 10% of the total OECD member countries R&D budget across all sectors in 2001 – the largest cumulative contribution of any industrial sector. As noted in the 2001 report of the WHO Commission on Macroeconomics and Health, development cannot take root without this kind of broad-based investment in health.

The developing world

Many developing countries understand the importance of innovation driven industries, including pharmaceuticals, for future economic growth. For example, life sciences innovation is a centrepiece of long-term industrial policy blueprints now being implemented by governments in India, China and Korea, as well as other markets.

Having succeeded in attracting manufacturing industries, countries such as South Korea, Taiwan, and Singapore are now moving toward the knowledge economy. Science and technology policies in these countries are creating a positive environment for investment in technology-oriented industries, including biopharmaceuticals. In Singapore, a Ministerial Committee was established in 2000 to work with leading international experts in the biomedical industry to create a Singaporean research-based pharmaceutical industry. Many international pharmaceutical companies are present in

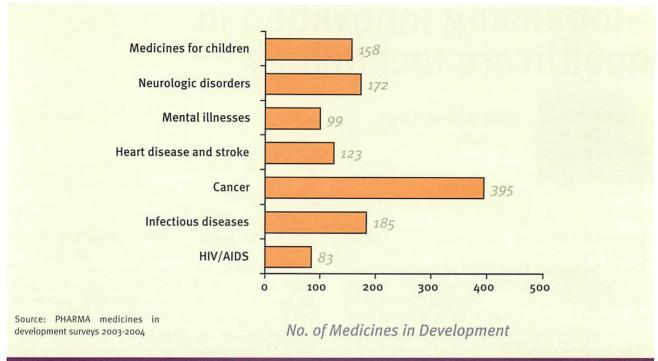


Figure 1: The development pipeline of medicines currently in human clinical trials

Singapore, with a some companies already investing in R&D, and many more running various development activities. In South Korea a large-scale programme was launched in 1994 to place Korea's biotechnological capabilities at globally competitive levels by 2007. Total investment is estimated at US\$15 billion, 60% of which will come from private industry.

A number of developing countries, especially China, India, Brazil, Thailand, Malaysia, South Africa and Argentina are well positioned to establish their own domestic researchbased pharmaceutical industries or at least contribute to global pharmaceutical R&D efforts. These countries possess resources, skills and capacities that are central for the pharmaceutical industry. In particular, countries such as India, China and Brazil are renowned for their human resources in natural sciences and technical disciplines, which provide a solid base for further industrial development.

The same countries have also world-class research institutes and technological excellence in such areas as biotechnology or chemistry that are core skills in pharmaceuticals. Also, a number of these countries already have experience in quality manufacturing of modern drugs and vaccines, active ingredients production and to some extent in the synthesis of new compounds and downstream clinical trials. For example, pharmaceutical and biotech companies from China and South Korea already participate in joint R&D partnerships with academic researchers and multinational companies aiming at developing drugs for malaria and tuberculosis - the Medicines for Malaria Venture and Global Alliance Against Tuberculosis are but two examples.

In the period 1997-2001, out of 184 new molecular entities only - four were developed outside of Europe, the United States and Japan. However, India, Brazil and China together account for more than 40% of the world's population and a substantial part of global deaths and DALYs. The disease profiles of their populations are extremely heterogeneous including diseases formerly associated with developed countries such as cardiovascular diseases, cancers, diabetes or neuropsychiatric disorders as well as diseases of the poor like tuberculosis, and region-endemic diseases such as Chagas disease, schistosomiasis and lymphatic filariasis. These countries, through pharmaceutical R&D, could both meet their domestic health needs and contribute to global research efforts. Given the growing need for new innovative medicines worldwide, it seems reasonable to argue that the establishment of research-based pharmaceutical industries in such key developing countries would benefit patients worldwide, and generate important financial rewards for the host countries.

Many developing countries could be cost-competitive with pharmaceutical multinationals in funding the cost of developmental research. For example, large Indian companies claim they could develop a new drug for just US\$120-180 million by tapping the lower cost base in their own home market. They see the key attractiveness of conducting R&D in India as lower costs of manpower and infrastructure, cheaper maintenance of equipment, and availability of raw materials and 'e-technical' scientists.

Another important source of competitive advantage for some of these countries may be their particular access to biodiversity and traditional knowledge resources. These resources may be used as a base for development of both a commercialised traditional medicines industry (which is becoming more and more popular among patients in developed countries) and a modern pharmaceutical industry.

Using natural resources as potentially valuable sources of novel biologically active molecules can facilitate this transition. It has been claimed that about 140 new drugs have originated directly or indirectly from Chinese medicinal plants by means of modern scientific methods.

A good example of a developing country that is supporting the growth of a research-based pharmaceutical industry is South Korea. By virtue of its outstanding human resources and government policies it is emerging as a pharmaceutical innovator on the global arena. By 2002, the Korean pharmaceutical and biotech companies had 78 and 167 drug candidates in development, respectively. Significantly, the great majority of these projects focus on diseases formerly associated with developed countries (cancers, neuropsychiatric diseases, but also osteoporosis, ulcers, or antidepressants) and many of them have been already outlicensed to global pharmaceutical companies.

Switching from an industrial policy that solely promotes imitation to one that advances innovation can carry important social and economic benefits. According to the UN Development Programme, technological breakthroughs 'are pushing forward the frontiers of how people can use technology to eradicate poverty', as they 'are creating new possibilities for improving health and nutrition, expanding knowledge, [and] stimulating economic growth.'

An area where the public and private sector have collaborated recently is in addressing diseases that

particularly strike hard in neglected populations concentrated in the poorer less developed countries. Limited space allows only a mention of several of these including the Medicines for Malaria Venture, the Global Alliance Against Tuberculosis, the Global Alliance for Vaccines and Immunization and the Accelerating Access Initiative. These alliances, aimed at extending access to and developing new medicines, combine the strengths of industry, foundations, governments and intergovernmental institutions; and they are an important complement to the private-market based system of developing and accessing needed medicines where the private market may tend to under-invest because of missing financing, incentives and infrastructure.

These public-private partnerships can be further investigated at the following website location: http://www.ifpma.org/sitedocs/Health/Health_Initiatives_Brochure May04.pdf. 🖸

Harvey E Bale is Director-General of the International Federation of Pharmaceutical Manufacturers Associations (IFPMA), Geneva, Switzerland. He worked previously at Hewlett-Packard and for US Trade Representative, where he received the Distinguished Service Award from the President of the United States, and has taught intellectual property and technology strategy at Georgetown University.

HIV/AIDS -Time is of the essence...

Article by Professor Alyson Warhurst, Warwick Business School

he bottom line is that an estimated 40 million people worldwide were living with HIV in 2003. Three million people died of AIDS that year and an estimated five million were newly infected. Approximately 50% of new infections occur in those under 25 years of age and most people infected by the age of 25 will die of AIDS-related illnesses before they reach the age of 35.

By 2010, it is estimated that an additional 45 million people will be HIV positive, with Nigeria, Ethiopia, Russia, India and China at highest risk. Indeed, 40% of future cases are expected to emerge from Asia. Most dramatic of the statistics is the current number of children living with HIV/AIDS – 2.5 million. In addition, there are over 13 million AIDS orphans.

The bare truth is that when HIV/AIDS is left unchecked, it

erodes the social and economic fabric of society and its development potential. A study conducted by UNAIDS in 2002 concluded that a 20% HIV prevalence corresponded to a 2.6% decrease in a country's annual GDP. Those countries with the worse prevalence rates are shown below in Figure 1.

The business case

HIV/AIDS harms all sections of business in respect of: increasing absenteeism as time is spent caring for family or attending funerals; staff turnover; productivity, as untrained workers replace experienced workers; morale, as stigma undermines working relationships; and declining markets, as the consumer base is reduced and foreign investment declines. These constitute sound reasons for business to

This table shows HIV/AIDS prevalence in 45 countries, arranged in alphabetical order. Each has been classified 'high' risk within its respective region on account of HIV prevalence. Country-specific prevalence is shown as a percentage in brackets. Absolute numbers are given for the total infected population of each country. China has been added because its level of prevalence is expected to rise dramatically by 2010.

```
36 Swaziland (33.4%) - 150,000
 Bahamas (3.5%) - 6,100
                                12 Dominican Rep. (2.5%) -
                                                                 24 Malawi (15.0%) - 780,000
                                                                                                 37 Switzerland (0.5%) - 19,000
Belize (2.0%) - 2,200
                                   120,000
                                                                 25 Malaysia (0.4%) - 41,000
                                                                 26 Mozambique (13.0%) -
                                                                                                 38 Tanzania (7.8%) - 1,300,000
Botswana (38.8%) -
                                13 Estonia (1.0%) - 7,700
                                                                                                 39 Thailand (1.8%) - 650,000
                                14 Ethiopia (6.4%) - 1,900,000
 300,000
                                15 Guyana (2.7%) - 17,000
                                                                 27 Namibia (22.5%) - 200,000
                                                                                                 40 Togo (6.0%) - 130,000
 Burkina Faso (6.5%) -
                                16 Haiti (6.1%) - 240,000
                                                                 28 Nepal (0.5%) - 56,000
                                                                                                 41 Trinidad and Tobago
 380,000
 Burundi (8.3%) - 330,000
                                Honduras (1.6%) - 54,000
                                                                 20 Papua New Guinea (0.7%) -
                                                                                                    (2.5%) - 17,000
                                18 India (0.8%) - 3,800,000
                                                                   16,000
                                                                                                 42 Ukraine (1.0%) - 250,000
6 Cambodia (2.7%) - 160,000
                                                                                                 43 Viet Nam (0.3%) - 130,000
                                                                 30 Portugal (0.5%) - 26,000
 Cameroon (11.8%) -
                                19 Italy (0.4%) - 100,000
                                                                 Russia (0.9%) - 700,000
                                                                                                 44 Zambia (21.5%) - 1,000,000
 860,000
                                20 Kenya (15.0%) - 2,300,000
8 Central African Rep.
                                21 Latvia (0.4%) - 5,000
                                                                 32 Rwanda (8.9%) - 430,000
                                                                                                 45 Zimbabwe (33.7%) -
                                                                 33 Sierra Leone (7.0%) - 150,000
                                                                                                    2,000,000
                                22 Lesotho (31.0%) - 330,000
 (12.9\%) - 220,000
                                23 Madagascar (0.3%) - 21,000
                                                                 S. Africa (20.1%) - 4,700,000
China (0.1%) - 850,000
                                                                 35 Spain (0.5%) - 130,000
10 Congo (Rep. of) (7.2%) -
  99,000
11 Côte d'Ivoire (9.7%) -
  690,000
```

Stable Deteriorating Improving

Source: UN AIDS adapted by Professor Warhurst from 'A Global Map of HIV/AIDS - prevalence, prevention and protection'; www.maplecroft.net

Figure 1: HIV/AIDS prevalence worldwide

respond to HIV/AIDS now.

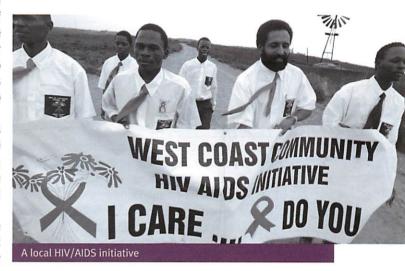
Time is of the essence...

Business is in a unique position to respond - companies maintain continuous contact with workers, they can provide on-site education programmes and counseling as well as fight discrimination and stigma. Companies can draw on ties with the international community as well as on a wealth of experience and skills that are relevant to combating the disease. They are in a position to facilitate or fund directly or indirectly health care for employees and their families and to support NGO partnerships that can make a difference. But this begs the question - is it the responsibility of business to do this?

The importance of early engagement to address HIV/AIDS is clearly illustrated by Thailand and South Africa. In 1990 Thailand and South Africa both had prevalence rates of 2%. In 2001, South Africa's prevalence rate was 20.1% while Thailand's went down to 1.8% due to a government backed prevention programme, although it crept up again last year.

The bottom line is that HIV/AIDS represents one area where global business has no choice but to engage - the costs of not engaging are so much higher and threaten the very

sustainability of business. Moreover, HIV/AIDS through its devastating effects on families requires business to interpret its sphere of responsibility more widely than has traditionally been the case with occupational health. The rapid growth of infection rates and widening geographical spread of HIV/AIDS means time is of the essence...



Business has a crucial role in the fight against AIDS



by Barbara Holmes, Director of Advocacy and Communications, Global Business Coalition on HIV/AIDS

t's been nearly a quarter of a century since AIDS was first diagnosed - a deadly 25 years where AIDS claimed the lives of over 20 million people. But it doesn't stop here: UNAIDS estimates that there are currently almost 40 million people living with HIV, with almost 5 million new infections each year.

AIDS is an exceptional disease. Unlike any other, it disproportionately attacks the most critical generation: young adults, the most economically active segment in society who are likely to leave behind dependent families and unraveling traditional economic and social systems.

To end this terrible pandemic all sections of society need to contribute work together, including the business community. Our mission at the Global Business Coalition on HIV/AIDS (GBC) is to harness the power of the global business community to end the HIV/AIDS pandemic. With over 160 member companies from all over the world the GBC is the preeminent organisation leading the business fight against HIV/AIDS.

AIDS is a core business issue for the private sector whether a company has a large workforce in regions hard hit by AIDS, or not. In some parts of the world an entire working generation is at risk, reducing economic productivity and profitability through increased absenteeism, increased staff turnover, loss of skills, and declining morale - thus directly impacting the bottom line. At the same time AIDS attacks the very fabric of society, curtailing revenues because of changing market demographics and consumer behaviour.

Tackling AIDS has transgressed beyond 'doing good' to being the necessary and responsible thing to do. Though, the position of many businesses hasn't changed for nearly 25 years - this is not 'our problem'. This disaffected attitude is particularly troubling in regions such as China, India and Russia – where statistics for world's fastest growing markets are only rivaled by the world's fastest growing AIDS figures.

The GBC's goal is to make responding to the epidemic standard business practice, recognising that the way in which companies act will depend on their size and individual

circumstances. The GBC believes that there are four fundamental ways how companies can respond to the pandemic. First, implementation of workplace programmes. Second, extension of their reach to support communities. Third, use of their core competencies, their products, innovation and skills. Fourth, advocacy for greater action by all sectors of society. Every business can make a difference. Businesses overcome the biggest obstacles to reach their business goals. Why not use their strength to fight the most deadly disease in our world today?

For more information on the GBC please visit: www.businessfightsaids.org

DHL's approach to HIV/AIDS

by Richard Corriette, Vice President, Corporate Citizenship, DHL

he international brand of the Deutsche Post World Net group, DHL, has operations in more than 220 countries and territories around the world. With a workforce of around 160,000 dedicated men and women, and 4.2 million customers, we are a part of the communities that are most impacted by this complex disease.

We have been learning about workplace programmes from others who are far more experienced than us in this area. For example, DHL is a member of the World Economic Forum's Global Health Initiative, and we are working with the Global Business Coalition on HIV/AIDS. Whilst we have been learning, we have used our vast transportation network to move much-needed documents, brochures and samples to help those making great efforts to find a cure.

Our next step is to look within our own organisation to

counts as 'family'). And if you decide to provide treatment you must ensure that an appropriate medical infrastructure is in place.

Providing implementation guidelines to empower the Human Resources Managers in the country operations.

Despite the challenges, we agree with the Global Business Coalition that all sectors of society have a duty to work within their sphere of influence to address these issues and that business should play its part.

□

More on DHL's approach to corporate citizenship can be found at www.dhl.com/corporatecitizenship.

DHL is a member of the World Economic Forum's Global Health Initiative, and we are working with the Global **Business Coalition on HIV/AIDS**

determine an approach to HIV/AIDS that is appropriate for DHL. There are many excellent best practice examples available for any company that is facing the challenge of developing a solution to workplace HIV. At DHL, however, we have discovered that there are some challenges to integrating these great examples to make them fit the company's specific situation. Amongst these are:

- Developing a policy that is complementary to the policies that are already in place, and that deals with issues of stigma and discrimination.
- Finding solutions that fit the cultures of the varied locations of the organization's operations.
- Working within the profit margins of your particular industry sector, as education and other services which must come with a workplace strategy have specific costs.
- Understanding the dilemmas of treating only your staff versus your staff and their families (and defining who



The role of public-private partnerships in health research for development



Article by Roy Widdus

he nature, potential and appropriateness of 'publicprivate partnerships' and what constitutes 'health research for development' are each themselves contentious issues.

A widely accepted definition of what constitutes 'a public-private partnership' remains elusive and other terms – such as public-private collaboration – may be preferable (Widdus, 2003). Nonetheless, the term has gained wide application and will be used here for convenience. Also for convenience the term 'private sector' will be taken generally to refer to the for-profit private sector particularly where pharmaceutical product development is under discussion. But where public sector engagement with industry is appropriate and useful can be viewed pragmatically or 'ideologically', depending on one's level of acceptance or abhorrence of for profitmotivation in the health area.

'Health research for development' likewise means different things to different people. Some commentators identify a '10/90 research gap', essentially defining basic research on current health problems in industrialised countries (such as cancer, mental illness, and cardiovascular disease), somewhat subjectively, as outside 'health research for development'. However, these same health problems occur globally, and in many developing countries they may be a bigger absolute aggregate burden than infectious diseases even though the latter occur disproportionately among the

A widely accepted definition of what constitutes 'a publicprivate partnership' remains elusive and other terms – such as public-private collaboration – may be preferable

poorest (Gwatkin and Guillot, 1999).

Development of health products (drugs, vaccines, diagnostics) needed everywhere usually occurs mostly in industrialised countries, but may not be counted as 'health research for development' by those who would give highest priority to 'essential national health research' that is sometimes only seen as relevant if conducted in a developing country and usually related to health systems operations.

More funding is definitely needed for research to reduce

health inequities, but over the long term so is a balanced portfolio of different types of health research, all of which are likely at some point in the future to contribute to better health for the poor, as well as the rich. Whatever the price of initial interventions, proof-of-principle can lead to approaches based on this knowledge that are more affordable and appropriate for poorer countries. For example, a 300-fold reduction in the price of hepatitis B vaccine over about a decade made the basic immunology research that led to it arguably 'health research for development'. Ironically, what has not been researched adequately is why it took so long for developing countries and bilateral aid agencies to be willing to fund this intervention once the price had reached a level that made it's use highly cost-effective, even an overall cost-saving, in the early to mid 1990s.

However, for the lack of space it is necessary to set these questions aside. The rest of this article will focus on the area where so-called public-private partnerships are addressing the health problems associated with poverty that currently receive most exposure, predominantly infectious diseases. These are, in some cases, health problems that in fact occur globally but which overwhelmingly affect the poor (such as HIV/AIDS, tuberculosis, pneumococcal pneumonia, rotavirus and other diarrhoeas, and unwanted pregnancy) as well as diseases that occur exclusively (or nearly so) in poor countries (such as some tropical diseases, including trypanosomiasis/sleeping sickness, leishmaniasis, and Chagas disease). Malaria could be positioned in either of these groups, as the distribution of many diseases is in fact, along a spectrum.

Improving the 'tools' available to achieve the MDG Targets Product development PPPs

At present many groups – the World Bank, the United Nations Development Programme (UNDP), WHO, developing and industrialised country governments – are seeking ways to achieve the UN Millennium Development Goals (MDGs), adopted in September 2000. Of these MDGs, about half relate directly or indirectly to health and one specifically calls for a partnership with the pharmaceutical industry to provide access to affordable essential medicines (Goal 8, Target 17).

This discussion focuses on the MDGs related to infectious diseases, but this does not imply that other health related MDGs, e.g., on improving maternal health, are any less important.

It seems very unlikely that the MDG targets for 2015 will be achieved in the poorer countries (UNDP, 2003). Unfortunately, many discussions on achieving the MDGs targets do not really acknowledge that the array of 'tools' available for reducing child mortality or combating HIV/AIDS, tuberculosis and malaria are inadequate for poorer countries (World Bank, 2003; Grow Up Free From Poverty Coalition, 2003). Notwithstanding the obvious need to energetically apply all existing tools for health improvement, there is also a need to invest in producing new tools where none exist, to improve those that are unsuitable for developing country settings, or to replace those threatened by drug resistance.

Relating this situation to achieving the health-related MDG targets (particularly to infectious diseases) suggests that:

- For child mortality we need an array of tools to choose from for each of its multiple etiologies, including preventive vaccines for pneumococcal pneumonia and diarrhoeal pathogens like Rotavirus and Shigella.
- For the prevention of HIV/AIDS we need prophylactic vaccines and vaginal microbicide gels; and cheaper, simpler diagnostic and therapies.
- ♣ For tuberculosis, since the current vaccine against tuberculosis (the BGC strain) combats only about 5% of the disease burden, not providing protection against disease in adults, we need improved tuberculosis vaccines. Better diagnostics (to replace X-ray and bacterial culture) and new drugs are needed since the current regime, requiring use of four drugs for six months, is hard to apply completely in resource poor settings, and resistance in many settings threatens it.
- For malaria, replacement drugs and especially combinations are needed because of the prevalence of resistance, as well as a preventive vaccine and simpler diagnostics.
- For many other less widely prevalent but important causes of disability and death in poor populations – such as trypanosomiasis/sleeping sickness, leishmaniasis, and Chagas' disease, we need improved diagnostic tools and better drugs, as well as preventive vaccines eventually.

Ideally for every disease or other health problems an array of tools is needed both among and within different facets of control – prevention, diagnosis and therapy. 'Basic' research is needed to understand the underlying risk factors for the problem as well as to underpin product development. Such basic research is generally considered to be a public sector responsibility but increasingly private, not-for-profit organisations are major funders; for example, foundations such as the Wellcome Trust and the Bill & Melinda Gates Foundation.

Most observers recognise that product development skills reside overwhelmingly in the for-profit pharmaceutical industry, specifically in the major R&D-based firms and the smaller so-called 'biotech' companies. There is an obvious need to engage these skills in development of products to

'Basic' research is needed to understand the underlying risk factors for the problem as well as to underpin product development. Such basic research is generally considered to be a public sector responsibility

combat diseases associated with poverty, although these products are generally commercially unattractive.

One highly visible category of public-private partnerships for health is the growing group of not-for-profit ventures attempting to develop products to combat diseases associated with poverty mentioned above.

In the mid-1990s, some new ventures began to emerge that addressed such product development challenges not from the starting point of a 'favourite' specific candidate but through promoting the parallel development of an array of candidates (a portfolio) to manage the risk of failure of any individual project. They vary considerably; indeed some prefer descriptive phrases other than the 'PPP' soubriquet. Their common characteristic is that they attempt to recruit pharmaceutical sector skills or resources (e.g., existing compound libraries) to these product development efforts. Some of these product development ventures as yet have only small portfolios, but others have at least five to six years of experience and sizeable portfolios, some over 25 projects (each of which can also be regarded as a 'PPP').

The number of discrete not-for-profit PD PPP ventures using a portfolio approach is approaching 20. The pathfinders, the International AIDS Vaccine Initiative (IAVI) and the Medicines for Malaria Venture (MMV, for malaria drugs) have been joined by others: the Global Alliance for TB Drug Development (TB Alliance), the Aeras Global TB Vaccine Foundation, the Malaria Vaccine Initiative (MVI), the International Partnership for Microbicides (IPM, addressing anti-HIV vaginal products), the Drugs for Neglected Diseases Initiative (DNDi) and others. Under each of these a varying number of projects is managed through 'virtual', typically contracted out, research and development activity.

Some other important public-private collaborations addressing product development have not been portfolio-based, but have focused on late-stage, essentially proven technologies. These include the development of the antimalarial LAPDAP, and the Meningitis Vaccine Program at PATH.

Readers interested in finding more information can refer to the excellent publication by Kettler and Towse (2002), a recent major review of these not-for-profit public-private collaborations (Widdus and White, 2004) and the website of the Initiative on Public-Private Partnerships for Health (www.ippph.org).

The above-mentioned review was based on an April 2004 meeting organised by the Initiative on Public-Private Partnerships for Health in collaboration with the Bill & Melinda Gates Foundation, the UK Department for International Development, the Rockefeller Foundation and the Wellcome Trust. The meeting consensus was firmly that the PD PPP mode of operations has proven itself sufficiently for further investment to be justified.

Consultations subsequent to the meeting identified a range

of areas for future attention:

- Development of common performance measures including methods to estimate potential public health impacts of anticipated products and the 'value added' by the PPP management methods (beyond those that are achievable by direct donor funding of the individual scientific projects).
- Coordination of clinical trials capacity development.
- Harnessing the potential of disease endemic countries.
- Ensuring financial sustainability (as there is an anticipated funding shortfall of at least US\$ 1.2 billion, and possibly over US\$2.2 billion through 2007, depending on assumptions).
- Improving communications and coordination (as the field is 'fragmented' among PD PPPs and along the Research-Development-Access [R-D-A] continuum).
- Fully recruiting potential industry contributors.

However, product development PPPs need study over many years to determine 'best practices' if these are to be based on new products successfully licensed and/or introduced.

Partnerships addressing access to pharmaceuticals are essentially operational research endeavours

As with product development, a number of long term, collaborative public-private agreements seeking to improve access to existing products have emerged in the last decade.

Company commitments to supply products needed for control of various tropical diseases have stimulated the creation of broader multi-sector coalitions to get them delivered effectively. Most of these efforts have included a disease prevalence mapping component, generating new information. Most are launched in a phased fashion, so as to learn from experience, as the programmes expand from pilot areas or countries. Hence they can be regarded in some sense as operational research endeavours.

A number of collaborations fall into this category: the Mectizan* (ivermectin) Donation Program (by Merck & Co.) for Onchocerciasis/River Blindness; the donation of albendazole and Mectizan® by GlaxoSmithKline and Merck respectively for elimination of lymphatic filariasis; the supply of various drugs, particularly eflornithine for trypanosomiasis/sleeping sickness principally by Aventis; the provision of the antibiotic azithromyocin from Pfizer for trachoma and multi-drug treatments for leprosy by Novartis.

Questions have been raised about disease control programmes based on drug donations regarding their ownership, integration with national health systems, coordination, implementation and impact. These have been researched by independent consultants through a four country study initiated by the Initiative on Public-Private Partnerships for Health, and supported principally by the UK Department for International Development. The results have recently been reported (Caines and Lush, 2004). They generally find significant benefits and few problems with donations to control tropical diseases but the situation with donation or discounted pricing programmes where the products supplied (e.g., for HIV/AIDS) have high value is more complex. Sustainability

appears to be the main question remaining, in some cases.

Global coordination and financing mechanisms can enhance health research and product development

Yet another category of PPP can have an impact on health R&D addressing diseases associated with poverty, namely those that are global coordination or financing mechanisms. This category includes: the Global Alliance for Vaccines and Immunization (GAVI) and the Vaccine Fund; the Stop TB Partnership, with its drug financing facility; the Roll Back Malaria Partnership (RBM); and the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM).

These are mostly mechanisms to get existing products into use more widely, usually by getting field implementers and funders to work together better. Sometimes they act as umbrellas for discrete product development PPPs, discussed above. Some beneficial impact on health R&D might also be expected through two mechanisms:

- Firstly, they can improve communication and coordination along the R-D-A continuum, which may reduce delays experienced in uptake of new products that would otherwise occur in a disjoined system. This is a specific goal of GAVI.
- Secondly, particularly where these umbrella organisations have control of financing, they will increase the likelihood of researchers and companies engaging on such 'neglected' products, through displaying that there are clear pathways to uptake and possible markets (even if small).

Public-private partnerships in the context of R&D and health systems

A Research Development-Access (R-D-A) continuum exists for each product/disease combination and, at the access end, these are embedded in the national health system that is inherently not disease specific.

PD PPPs and 'Access' PPPs occupy discrete spheres in this bigger picture and each generally defines a strict limit on their intended scope so as to make their task manageable. Thus they need to effectively manage interfaces with many other players in this bigger picture. For PD PPPs, 'upstream' with basic researchers and their funders (for translation of basic research into candidate product concepts) and 'downstream' with disease endemic countries and funders of disease control programmes for ensuring uptake. Access PPPs must interact principally with the health system in poorer countries, and ultimately pass on experience to best mesh with overall health systems. PD PPPs can learn from the experience of access PPP in product introduction and generalists in health systems development should be open to lessons from targeted efforts. The global coordination and financing mechanisms mentioned above that address disease or technology specific areas should be alert to the need to foster discussions on integration of targeted PPPs with general health system strengthening efforts.

Potential for public-private partnerships in other areas of health research

Obviously not all health problems can be alleviated with

'technological fixes' like drugs or vaccines alone. Risk factor, social, behavioural and operational research are all also needed to ameliorate the health inequities that are faced by the poor, especially the poor in developing countries. The ways in which public-private collaboration could be brought to bear on these sorts of research deserves much greater consideration than they have received to date. Private sector research expertise for example in market assessment, behaviour change and diffusion of innovation, could well be applied more extensively to health problems of the poor.

Conclusions

The existing array of PPPs addressing product development or access is a result of the efforts of individual champions, not a systematic plan by donors, international agencies, or national governments. There are undoubtedly gaps, as well as areas of duplication and/or sub-optimal scale of operations and/or degree of integration with broader efforts. However, the manner in which such partnerships emerge presents difficulties in optimising use of this vehicle for global health improvement.

At the country level, it is clearly desirable that governments identify policy and strategic frameworks for their health systems, within which collaboration with private sector/forprofit entities can contribute. Lacking such a basis, pharmaceutical companies, other for-profit health services, and NGOs cannot be expected to take the lead on this public sector responsibility.

At the global level, consideration (by international agencies or other organisations) of where private sector expertise most needs to be recruited to product development (and other R&D on health inequities) is an obvious area for attention. However, given the diversified nature of the current array of collaborations and their funders, it is not clear - to me at least - how the PPP field can be 'managed', if at all, at global level.

Observations of the public-private collaborations currently extant, whether in research or other areas, can guide partnering strategy. The key factor seems to be identifying some contribution that the private partner is in a unique position to make, rather than general pleas based on public health need or 'corporate social responsibility'.

Public-private collaboration is a means to bring complementary skills and resources to bear on health inequities. It has great potential: it is currently fashionable and reasonably funded. Sustaining long-term - 10 to 20 year - commitment will be an ongoing challenge given the constantly changing interests, strategies and staff in the potential funding sources.

Roy Widdus is Project Manager of the Initiative on Public-Private Partnerships for Health of the Global Forum for Health Research, Geneva, Switzerland. Trained in biochemistry, microbiology and epidemiology, he has had a varied career in academic research, drug design and industrial microbiology in industry and senior policy roles in government, advisory and international organisations. He was head of international health activities at the US National Academy of Sciences' Institute of Medicine, Executive Secretary of the US National Commission on AIDS, Interim Director of the US National Vaccine Program Office and Coordinator of the multiagency, Children's Vaccine Initiative (1995-2000).

References

Caines K, Lush H., 2004. Impact of Public-Private Partnerships Addressing Access to Pharmaceuticals in Selected Low and Middle Income Countries: A Synthesis Report from Studies in Botswana, Sri Lanka, Uganda and Zambia. Published by the Initiative on Public Private Partnerships for Health, Global Forum for Health Research, Geneva.

Grow Up Free From Poverty Coalition, 2004. Eighty Million lives: Meeting the Millennium Development Goals in child and maternal survival. Available at www.savethechildren.org.uk

Kettler, H, Towse A. 2002 Public-private partnerships for research and development of medicines and vaccines for diseases of poverty. Office of Health Economics, London.

Gwatkin DR, Guillot M. 1999. The burden of disease among the global poor. Human Development Network, Washington, D.C., World Bank.

United Nations Development Program 2003 Human Development Report -The Millennium Development Goals: A compact among nations to end human poverty. UNDP, New York.

Widdus R. 2003. 'Public-private partnerships for health require thoughtful evaluation.' Bulletin of the World Health Organization 2003, 81 (4)

Widdus R, White K. 2004 Combating Diseases Associated with Poverty: Financing Strategies for Product Development and the Potential Role of Public-Private Partnerships, Published by the Initiative on Public-Private Partnerships for Health, Global Forum for Health Research, Geneva. Available in abridged and full versions.

World Bank, 2003. The Millennium Development Goals for Health -Rising to the challenge. World Bank, Washington, DC. Available at: www1.worldbank.org/hnp/MDG/MDGESW.pdf

New drugs for neglected diseases: what will it take?



Article by Bernard Pécoul

n wealthy countries, patients have access to a growing palette of drugs to combat cancer and diabetes, avert hypertension and lower cholesterol levels. New and better treatments are constantly being developed to prevent the major causes of morbidity and mortality, thanks to the vast progress achieved in fields as far-ranging as molecular biology, chemistry and engineering.

But for some, these scientific achievements have meant very little. Patients suffering from diseases such as leishmaniasis or sleeping sickness are still being treated with drugs that were discovered empirically in colonial times. These drugs are mostly toxic, expensive and difficult to administer. In addition, some are increasingly ineffective due to parasite resistance. For other diseases, such as Buruli ulcer or Dengue fever, there is simply no treatment.

Compared to the vast amounts spent on wealthy country diseases, very little is spent on developing new treatments for the world's poorest people and the diseases that affect them. US\$100 billion was spent on health research last year (Global Forum for Health Research, 2004). We estimate that 0.5% of this amount went towards developing new and urgently needed treatments for neglected diseases. The result of this ongoing neglect is that less than 1% of the 1,393 new drugs produced between 1975 and 1999 were intended for infectious tropical diseases (Trouilleret al, 2002).

'Neglected diseases' are so-called when the majority of people affected are poor, when few or no treatment options exist and when their market potential is insufficient to attract a private sector response (Drugs for Neglected Diseases, 2001). There is a hierarchy of neglect: some diseases may be of little appeal but still generate some interest from the private sector, while others fall completely outside the scope of industry – these are the 'most neglected diseases' (see Figure 1).

Understanding the crisis

Ironically, the organisms responsible for neglected diseases have been extensively studied and written about. For example, a simple Medline search for 'trypanosomes', the parasites responsible for the killer disease sleeping sickness (see box), shows that over 12,650 papers were published in the last twenty years (Torreele, 2003). The academic research community is clearly interested in these parasites. So why has this extensive capital of basic research not been translated into new drugs for these diseases?

Patients suffering from neglected diseases live in extremely

The case of sleeping sickness

Human African Trypanosomiasis (sleeping sickness) is a parasitic infection transmitted by the bite of a tsetse fly. The first stage of the disease often goes undiagnosed, while the second stage is characterised by neurological symptoms which, if untreated, result in coma and death. Half a million people are currently affected in 36 African countries.

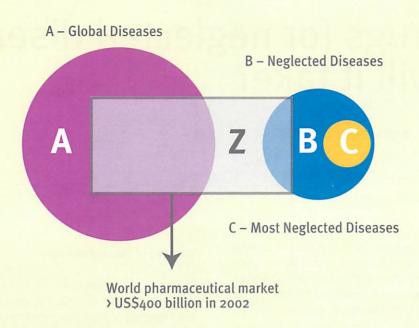
For decades, the mainstay of sleeping sickness treatment was the arsenic-based drug melarsoprol. This highly toxic drug can cause devastating side-effects and kills one in 20 patients. But it continues to be used because the disease itself is 100% fatal if left untreated.

In 1990, however, an anti-cancer drug, eflornithine, was found to be effective against sleeping sickness. Although production was abandoned five years later because it was deemed unprofitable, it was resumed again in 2001 under pressure from WHO and Médecins Sans Frontières.

But eflornithine is not an ideal treatment either: it requires 14 days' hospitalization, during which time the patient is given an intravenous drip every six hours. The drug can cause severe problems, such as septicaemia, and cannot be used in pregnant women. It was not developed with the needs of developing country patients in mind, with the result that it is very difficult to administer to those patients who need it most.

remote areas and tend to be both poor and voiceless: most developing countries have no resources to invest in R&D for the diseases that affect them, and there are no patient lobby groups to call for more attention for these diseases. These patients have simply been left behind by the market-based mechanisms that ensure drug development because they represent little or no profit potential for the pharmaceutical industry.

The development of a new drug is time- and labour-intensive, and holds a high risk of failure, since only a handful of promising compounds will make it through stability assays, toxicity studies and clinical trials all the way to production. When market prospects are low, cracks appear



A - Global Diseases (e.g. cancer, cardiovascular diseases) affect people everywhere and constitute the major focus of the R&D-based pharmaceutical industry.

B - Neglected Diseases (e.g. malaria, TB, HIV/AIDS) mainly affect people in poor countries, but a small market in wealthy countries prompts R&D efforts.

C - Most Neglected Diseases almost exclusively affect people in developing countries who are too poor to pay for treatment. They do not represent a viable market, and therefore fall outside the scope of the drug industry's R&D efforts. Most neglected diseases include sleeping sickness, Chagas disease, Buruli ulcer, Dengue fever, leishmaniasis, leprosy, lymphatic filariasis and schistosomiasis.

Z - Drugs not corresponding to major public health problems (comfort and lifestyle).

Figure 2: Global pharmaceutical market and disease R&D targets

more readily in the pipeline. Looking at the specific components of the drug development process, it is possible to see exactly how the mechanisms fail to work for neglected patients (see Figure 2).

Squaring the blame

The private sector has clearly failed to address the needs of neglected patients. But how far can the pharmaceutical industry be blamed for making business-minded decisions? Companies function in a competitive market and must work to keep the advantage over their competitors by developing new drugs that can achieve a high profit margin. Besides, the private sector should not be held responsible for the world's

Ultimately, it is the role of governments to support research and development (R&D) for diseases that don't interest the private sector: they are accountable for public health. But governments everywhere have left it to the private sector to decide on R&D priorities, apparently without examining the

effectiveness or implications of this choice.

Addressing the problem

Thankfully, in recent years, some attention has shifted towards the diseases that plague developing countries, and efforts have been made to start addressing the problems posed by these 'diseases of poverty'. In 1975, the WHO, the World Bank and the United Nations Development Programme created the Special Programme for Research and Training in Tropical Diseases (TDR), designed to help coordinate, support and influence global efforts to combat a portfolio of major diseases of the poor and disadvantaged - and specifically to improve existing and develop new approaches for preventing, diagnosing, treating, and controlling neglected infectious diseases (WHO-TDR, 2004). TDR can be given credit for setting up a number of successful drug development projects, despite very limited resources (an annual budget of just US\$30 million).

Several public-private partnerships (PPPs) have also seen

Discovery

Predevelopment

Availability to patients

gap 1

Basic research is published but pre-clinical research is not considered worthwhile

gap 2

Validated candidate drugs don't enter clinical development because of profitbased company choices

gap 3

Drugs never reach the patient (registration problems, lack of production, high prices, or drugs poorly adapted to local conditions).

Figure 2: Gaps in the drug development process

the light of day during the last five years, including the Medicines for Malaria Venture (MMV) and the Global Alliance for Tuberculosis Drug Development. These initiatives have several drug projects in the pipeline. But most PPPs unfortunately still focus on the 'Big Three': HIV/AIDS, TB and malaria. Since these diseases still hold some potential for profit because of the reasonable size of the market, they have been able to involve the private sector to some extent. The grave impact of these three diseases has also received an enormous amount of press and public attention. Although it is still insufficient, this awareness has led to a considerable scale-up of resources to fund health programmes, particularly through the Global Fund to Fight AIDS, TB and malaria. Unfortunately, a similar effort to scale up R&D funds is yet to happen.

For visceral leishmaniasis, sleeping sickness and other most neglected diseases, the situation is far worse. As these have yet to make it into the public consciousness, the resources allocated to them are still pitifully poor, especially for R&D. Since patients affected are of no strategic interest, creative solutions are needed in order to seriously tackle the crisis.

Filling the gaps

The Drugs for Neglected Diseases Initiative (DNDi) is seeking to create a creative model to develop new drugs for patients suffering from the most neglected diseases. The initiative, which brings together seven organisations from around the world, identifies patient needs and matches them with opportunities in R&D to design drugs that address these specific needs and are adapted to developing country conditions (for instance, short-course treatments that do not require hospitalisation, oral formulations rather than injections, etc.). In parallel, it conducts advocacy work to build public responsibility and leadership in addressing neglected patient needs.

DNDi does not research and develop drugs by itself but rather manages projects through the development pipeline. In order to cut costs and maximise efficiency, it uses existing expertise and capacity in biomedical research, clinical trials and pharmaceutical production in both developed and developing countries, and contributes to building additional

capacity in a sustainable manner through technology transfer in the field of drug R&D.

To help fill the gaps, DNDi is working on projects at different stages of the drug development process. Long-term projects starting with the identification of new lead compounds active

> In order to cut costs and maximise efficiency, it uses existing expertise and capacity in biomedical research, clinical trials and pharmaceutical production

against the target parasites, lead optimisation, and preclinical pharmacology and toxicology will bring new compounds into clinical development. Pursuing opportunities that will make better use of existing drugs and compounds and ensure drug availability to patients, DNDi also works on shorter-term projects such as developing new drug combinations and new formulations that are better adapted to patient needs, or completing drug registration dossiers (DNDi, 2004).

What else can be done?

These initiatives can only ever be a part of the solution. Longer term and in the wider arena, a system must be set up to ensure the creation of new treatments which address the needs of neglected patients. There is no one solution to fit this complex problem, but some major recommendations can be proposed:

- A framework must be developed to encourage the international research community (both private and public) to develop and implement an essential R&D agenda that is based on real patient needs. To do this, a complete needs-assessment of all neglected and most neglected diseases must be carried out, therapeutic and preventive aims defined for each disease, and a list of priorities established. It is within the mandate of the World Health Organization to carry out this work.
- Governments have failed to address the gaps created by the private sector's market-based system, and their inaction has compounded the R&D crisis. They must now face up to their responsibilities to tackle the issue and increase funds allocated to R&D. In 2001, the Commission on Macroeconomics and Health

recommended that donor countries spend US\$1.5 billion a year on R&D to create new affordable and effective drugs and vaccines for neglected diseases (World Health Organization, 2001). This would be a good start. In parallel, governments must design policies to strengthen drug R&D for neglected diseases in their own countries. It has been suggested that a tax-like system - similar to the ecological tax whereby industries are made to pay for pollution or energy use - could be imposed on pharmaceutical companies to oblige them to invest resources in neglected diseases (Médecins Sans Frontières, 1999). If companies were made to spend 2% of their R&D budget on neglected diseases, the total amount spent on these diseases would increase by US\$ 500-750 million (IMS Health, 2004). If the philanthropic community were then to put forward an additional US\$250-500 million, US\$2.5-3 billion would become available for R&D for neglected diseases. This amount represents just 2.5-3% of the global annual budget on health research - a very reasonable ambition.

- The public and private sector could also be encouraged to transfer R&D technology to developing countries (North-South and South-South training and sharing expertise), and share access to their compound libraries so that others can use and benefit from the discoveries they choose not to pursue.
- Today, the end goal of research seems to be to publish or patent. But the focus needs to shift to implementation of new effective technologies for patients. Genuine therapeutic innovation should be more highly rewarded than technological innovation. Governments could also be encouraged to make provisions for low- or no-cost 'public' and 'social' patents to be granted with public interest clauses, or to embrace open source collaborative models, such as the Human Genome Project.
- In order to assist R&D for new tools for neglected

- diseases, governments and international organisations must secure the market for producers, (as has been done successfully for the Expanded Programme on Immunization or 'essential vaccines'). New drugs for neglected diseases must be made affordable by pricing them at cost of goods plus a small profit margin. To achieve this, the cost of R&D will have to be subsidised.
- Regulatory agencies in developed countries (e.g. FDA, EMEA) can help facilitate the registration of, and hence access to, new drugs or vaccines in developing countries by sharing experience and building capacities in endemic countries. To fast-track drug registration for neglected diseases, developing country agencies must also be encouraged and supported to carry out their own risk/benefit assessment of new drugs. The imposition of Western regulatory standards is not always appropriate when dealing with deadly diseases for which few or no treatments exist.

Redirecting today's knowledge and scientific expertise to neglected needs will require a shift in the way essential health tools are valued, and how efforts are organised globally to ensure their development and widespread availability. At the end of the day, addressing the crisis in health R&D research is a government responsibility requiring policy, action and accountability.

Bernard Pécoul joined Médecins Sans Frontières (MSF) as a volunteer physician in 1983 in Honduras, Thailand and Malaysia, managing public health projects for refugees. He was a co-founder and director of research and training from 1988-1991 at Epicentre, an epidemiological research organisation in Paris, France, From 1991-1998, Bernard led the French section of MSF as Executive Director, and from 1998 to 2003, he was Executive Director of MSF's Campaign for Access to Essential Medicines. Currently, Bernard is Executive Director of DNDi.

References

DNDi, 2004. DNDi: An Innovative Solution. DNDi, Geneva.

Drugs for Neglected Diseases Working Group and MSF's Campaign for Access to Essential Medicines, 2001. Fatal Imbalance: The Crisis in Research and Development for Drugs for Neglected Diseases. DNDi, Geneva.

Global Forum for Health Research, 2004. The 10/90 Report, 2003-2004. Global Forum for Health Research, Geneva.

IMS Health, 2004. See: http://www.imshealth.com.

Médecins Sans Frontières, 1999. Amsterdam Statement to WTO Member States on Access to Medicine (1999). See: www.accessmed-msf.org

Torreele, E, 2003. 'How the poor die - getting the research community to address global health needs'. Biochemist Vol 25, No 6, pp 11-13.

Trouiller, P. et al. 2002, 'Drug development for neglected diseases: a deficient market and a public health policy failure'. The Lancet 359: 2188-94.

WHO-TDR, 2004. See: http://www.who.int/tdr

World Health Organization, 2001. Macroeconomics and Health: Investing in Health for Economic Development, Report of the Commission on Macroeconomics and Health, presented to the WHO Director-General in December 2001. World Health Organization, Geneva.

A role for schools of public health in development



Article by Barry R Bloom

he world changed in innumerable ways following the tragedy of 11 September, 2001, the 5 October report of the first case of anthrax in the United States, and the global threat of SARS in 2003. People confronted with catastrophic consequences of epidemic diseases and terrorism looked to institutions, particularly public institutions, to provide protection. One of those institutions most frequently cited in the media as crucial was 'the public health system', generally now recognised as having long been neglected in both developed and developing countries.

Key questions that need to be addressed are: What is public health? How is it distinguished from medicine? What are the critical issues that public health will be challenged to address in the 21st century. And what role can and should Schools of Public Health play in health systems and economic development?

At a first approximation, we like to say public health deals primarily with preventing disease, while medicine is concerned with treating disease in people already sick. And public health focuses primarily on the health of populations, while medicine deals with the health of individuals. Much evidence has established that it is more cost-effective in both human and financial terms to prevent disease than to cure it. When it is carried out effectively, and outbreaks of disease are, in fact, prevented, there is little to be seen by the public; when public health disasters cannot be prevented, there is often a great economic and political price to be paid. Public health research is in the business of identifying risks for ill health, and devising strategies to enable people and populations to avoid known risks for disease. This role is often described as health promotion: that is, changing exposure to risks in our environment or modifying unhealthy behaviors.

There are many institutions worldwide that offer degrees or certification in public health, often departments within

Much evidence has established that it is more cost-effective in both human and financial terms to prevent disease than to cure it. When it is carried out effectively, and outbreaks of disease are, in fact, prevented, there is little to be seen by the public; when public health disasters cannot be prevented, there is often a great economic and political price to be paid

universities and medical schools, and many make valuable contributions to the public health workforce in countries that struggle, often heroically to meet the needs of populations, particularly the poorest and most disadvantaged people in countries. But in terms of providing new knowledge in public health and compelling evidence to affect policy in meaningful ways, schools of public health, in my view, should have the intellectual critical mass to contribute in each of four areas:

Research: Research can be defined as the generation of new knowledge and providing scientific evidence for decisionmaking at the individual or societal levels. The disciplines of public health embrace a wide variety of approaches to knowledge of the public's health and risk factors for disease. These include:

- the 'probabilistic sciences', epidemiology and biostatistics that identify and associate risks in environment, behaviour or genetics, to disease outcomes, and which are critical for designing and analysing clinical trials and interventions:
- the 'mechanistic sciences', laboratory science to elucidate mechanisms of disease susceptibility, risk and causality. and that lead to new interventions such as drugs and vaccines:
- the 'behavioral and social sciences' to understand the social and behavioral determinants of illness and societal changes that result in better health;
- the 'policy sciences', critical to analysing health systems, the health and economic burdens of illness, the costs. and the cost-effectiveness of interventions, and the quality of health systems. As Julio Frenk defined it, 'A health system is a population's organized social response to its health problems... It represents the common vehicle through which all interventions we talk about are actually delivered to actual populations' (Frenk, 2004).

Training: Half of the annual deaths in the US and almost certainly a greater fraction globally can be prevented or delayed by public health interventions. If the major risks for premature death and disability identified by WHO are poor nutrition, unsafe sex, blood pressure, tobacco, alcohol and unsafe water and sanitation, there is a huge mission for training in public health to prevent or postpone them. While training of degree students, practitioners and researchers, in public health and medicine will become more important as

HEROES WANTED

ANNOUNCING

a prestigious new master's and doctoral scholarship program that will fully fund outstanding scholars and leaders—those with the potential to become the public health heroes of the future.

THE HOPKINS

Sommer Scholars will be trained to confront complex global health issues by pursuing critical discovery and its translation into health policies and programs.

Sommer Scholars

will learn to protect the health and save the lives of people worldwide—millions at a time.

PROGRAM

For more information, visit our website: www.jhsph.edu/SommerScholars



increasing public expectations and the threat of disasters make clear, public health training is essential also for political leaders at national and local levels, teachers, police, firemen, social workers, and most importantly, the public.

- UN Secretary-General Kofi Annan has defined competencies as the combination of skills, attributes and behaviours that are directly related to successful performance on the job. Competency represents observable and measurable knowledge, skill, ability, behaviours and attitudes associated with excellent job performance, work results or outputs. Five broad areas of knowledge have been designated in the United States as essential for accreditation of Schools of Public Health to award advanced degrees in public health: epidemiology, biostatistics, environmental health, behaviour, and health administration and management. It is assumed that students, particularly those with medical training, will have a basic understanding of the biology of disease. All students are required to have a practicum or culminating experience addressing a real world problem.
- To that the Institute of Medicine has recently suggested additional areas of competency, some of which may be relevant to developing country needs, and others not. They include: communication, cultural sensitivity/ competency, community-based participatory research, global health, informatics, genomics, policy and law, and ethics (Gebbie, Rosenstock, and Hernandez, 2003).
- A PAHO conference, 'Mapping Competencies for Communications for Development and Social Change' in 2002 listed as important considerations: importance of

participation, listening and dialogue; respect for human and cultural diversity, tolerance; value of local people and resources and social change (PAHO, 2002).

Communication: If public health is to fulfil its responsibility to prevent death and illness and promote health, it will have to do a great deal better in communicating risks in ways that inform and motivate, rather than frightening the public. The public responses to the anthrax, influenza and SARS outbreaks and HIV/AIDS underscore how crucial it is for our leaders and the public to be adequately informed, have rapid access to accurate information, and to provide truthful information to the public that is empowering, not paralysing. This is an area that can be taught, but is largely forgotten in medical and public health education.

Practice: All the knowledge from the laboratory and from population research will be squandered if it is not put into practice in ways to improve the health of the public. There is a greatly under-appreciated but enormously dedicated group of people doing the work of public health. In few places in the world do they have the professional training to meet the real world needs and expectation, or the certification of their training that compels the respect of the governments, and people they serve - or financial rewards. They can, of course, only be effective if our elected officials and policy makers understand their importance and support their work. One of the major problems regarding the public health workforce in developing countries is the lack of a career path for professionals at multiple levels in the health system, a weakness painfully exposed by the infrastructure needs in combating HIV/AIDS.

What will the new public health problems of the 21st century be?

It is astonishing that until the late 1990s the only metric for health accepted by the World Health Organization was mortality. Yet as people live longer, the burden of non-fatal conditions, including illness, disability and injuries, must be assessed if we are to gain an accurate understanding of the health of populations. If governments are to make rational choices of priorities for allocation of scarce resources between competing sectors, or even within the health sector, it is essential that there be population-based information on the burdens and risks for disease in each country. This implies both a system of health surveillance, household surveys, and a repository of national and local health statistics and Schools of public health can and should contribute to each of these critical areas. Further, they should be the major academic sites for the analysis of data that can help countries set their priorities to meet the health needs of their people.

Several new metrics including QALYs (Quality Adjusted Life Years), DALYs (Disability Adjusted Life Years) and DALE (Disability Adjusted Life Expectancy) have now been developed to make such assessments possible. In a landmark series of publications, *The Global Burden of Disease* (Murray and Lopez, 1996) and the *World Development Report*, 1993 (World Bank, 1993), researchers used the DALY, a single, time-based measure that captures years lived with a disability as well as years of life lost through premature death, to sum the overall burden of disease in populations, to measure the burden of specific conditions, illnesses and injuries in populations, and to make comparisons between populations.

Our unfinished agenda – infectious diseases

In 2001, infectious diseases still represented 32% of the global burden of mortality and 41% of the global burden of disease (World Health Organization, 2000). In sub-Saharan Africa, they represented 68% of deaths from all causes. The HIV/AIDS epidemic continues to increase, with staggering proportions of the populations in Africa now afflicted, while in Asia the large-scale epidemic is still in its early stages. HIV/AIDS is responsible for the decline in life expectancy to below 40 years in five African countries. Yet there is compelling evidence from Senegal, Uganda, Thailand and Brazil that it can be controlled in resource-poor countries.

The major killers beyond HIV/AIDS remain childhood respiratory diseases, and diarrhoeal diseases, tuberculosis, malaria, but there are many more. In the battle between pathogens and hosts, there is a constantly changing pattern of emerging infectious diseases worldwide, including hepatitis C, dengue fever, West Nile virus, meningitis, multidrug resistant bacterial and parasitic infections including tuberculosis, dysentery and malaria, and many more. Our infectious disease agenda is unfinished, and will inevitably remain so, requiring continued training and vigilance. Here surveillance and competent laboratories for identification of

epidemic threats are essential, and schools of public health should be able to make a major and special contribution.

The coming epidemic – chronic diseases and aging populations

In a sense, the success of public health and childhood immunisation in reducing the number of childhood deaths from infectious disease is responsible for the increasing burden of chronic diseases. In 1998, for the first time, chronic diseases represented a greater global burden of disease than infectious diseases and the principal diseases of developing countries and those of industrialized countries appear to be converging (World Health Organization, 2000). Cardiovascular disease worldwide the major cause of adult mortality and morbidity, followed by cancer and diabetes. Obesity is increasing in many countries of the world at an alarming rate, with the consequences of diabetes, heart disease and major disability. Perhaps more surprisingly, for some, was the finding of the Global Burden of Disease analysis that psychiatric illnesses, and particularly depression, are becoming major causes of disability worldwide. Depression is already the leading cause of disability among women in both the industrialised and the developing regions, and is projected to become the second largest overall cause of disease burden globally by 2020. Here it is clear that focusing on prevention of the major risks (World Health Organization, 2002), for example tobacco responsible for 10 million deaths each year by 2025, undernutrition in the poorest countries, simultaneously with poor diet and lack of exercise, often in the same countries, leading to obesity and diabetes; and national efforts to prevent injuries can have a major impact on reducing premature death and disability.

The unnecessary epidemic – injuries and casualties of war and humanitarian emergencies

Before the analysis of the Global Burden of Disease, it was unclear how much of the burden of disease and disability was caused by injuries. The most rapidly rising form of injuries are those caused by motor vehicle accidents, a subject hardly considered by public health until now, yet which is projected to be the third largest cause of disease burden globally in 2020. Clearly, public health has a great deal to contribute to reducing injuries to the elderly, in the work place, and from all other causes. Less amenable to public health prevention will be wars and humanitarian emergencies. Between 1955 and 1998, there were 31 civil and foreign wars, 35 million displaced persons and refugees, and a large number of states that failed; and it was civilians, not combatants, who bore the brunt of these upheavals. While it is clearly difficult to get accurate figures, the enormous and increasing burden of war and civil strife on health has been greatly underestimated (World Health Organization, 2000).

Projecting the future

Predicting the Burden of Disease: Two of the research tools of the 'probabilistic sciences', epidemiology and biostatistics,

INTERNATIONAL HEALTH & POPULATION MANAGEMENT SKILLS

solutions for today's developing world



The Centre for Health Planning and Management, including the Sir David Owen Population Centre, aims to be at the forefront of new thinking and teaching in the fast changing fields of Health and Population Management.

We offer a range of leading edge study options designed to meet the needs of experienced development and health professionals.

> Postgraduate Study

With a choice of full (12 months) and modular study, the following courses begin in January and September of each year and combine contemporary thinking on key issues with the teaching of practical management skills and techniques.

- MBA/Diploma: Health, Population & Nutrition in Developing Countries
- · MSc/Diploma: Human Resources in Health
- MSc/Diploma: Reproductive Health Management
- · Research degrees, MPhil and PhD

Intensive Workshops

We also have a series of intensive, 4-week workshops for managers and professionals who want to update their knowledge and enhance their skills. Focused on small working groups, the workshops deliver a combination of innovative ideas and practical applications.

The Keele Advantage

- In-depth understanding of the needs of developing health services
- · A growing reputation as a leading edge centre of study
- · An attractive campus location
- · Guaranteed accommodation available on site
- · Easy access to major transport links
- · Award-winning conference facilities
- · Excellent resource and strong teaching support

For more information, contact Miss Sarah Newton Tel: +44 1782 583 191 Email s.newton@hpm.keele.ac.uk www.keele.ac.uk/depts/hm/index.htm



are the use of surveillance data of diseases and modeling to predict everything from the spread of diseases, to growth of populations, to the burdens of disease. Using statistical projections under assumptions of continuing secular trends in all categories of disease, the Global Burden of Disease Unit at the Harvard School of Public Health has updated projections of the WDR 1993 and estimated the public health problems likely to be faced in the year 2020 (Michaud et al., 2001), barring unanticipated epidemics or major impacts of terrorism: the top three burdens of disease (in DALYS) are ischemic heart disease, depression and road traffic accidents, not what most public health experts might have anticipated they would be.

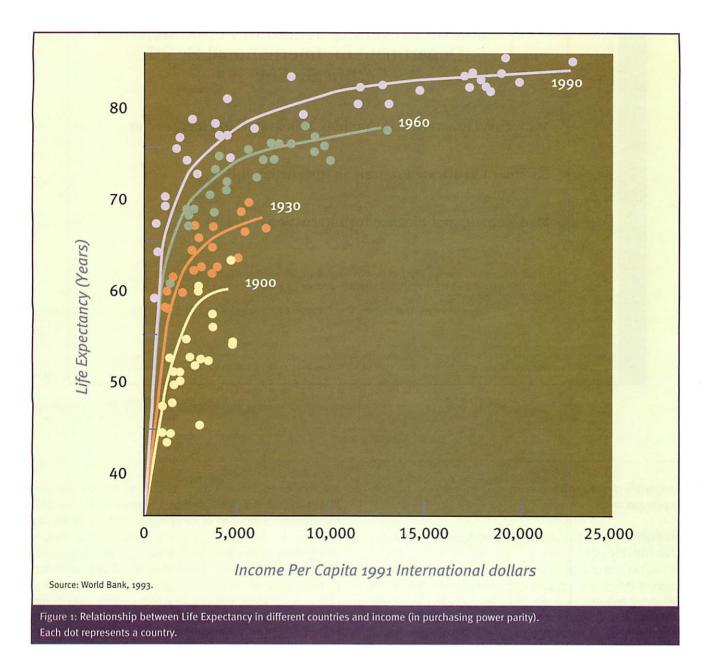
These projections are both disturbing and encouraging. For most of the populations in Europe, the Americas and Asia, there is an increasing convergence of diseases and risks, such that the problems of the developing nations and the industrialised nations are increasingly similar, with a diminution of communicable diseases and increases in life expectancy, chronic disease and the problems of ageing. This is not true in sub-Saharan Africa, regrettably, in part due to the HIV/AIDS epidemic, where life expectancy in five countries in Africa has now fallen to below 40 years. Nowhere is there a greater need for preventive public health training and services. Whether the causes are cardiovascular disease and stroke, HIV/AIDS, obesity and diabetes, or violence and injury, it is obvious that most premature deaths and disability, clearly more research in developing countries is needed to be able effectively to prevent or postpone them with public health interventions.

Integrating intrinsic vs extrinsic risks - the impact of the human genome

Following the mapping and sequencing of the human genome and the identification of specific genes that predispose or cause diseases like many forms of cancer, Alzheimer's disease, etc., researchers in public health can now study not only the extrinsic risk factors for disease, but also the intrinsic risks within individuals and populations. A new field, public health genetics, is emerging, in which intrinsic risks, individual and population genetic risks and predispositions, and environmental risks and exposures will be integrated to provide another level of insight into how disease outcomes are determined, and how we can intervene to prevent them. One of the many promises of the human genome project is the promise of revealing mechanisms, including molecular clues and pathways that can be linked to epidemiological associations. They will permit the formulation of new hypotheses, new epidemiological studies and new epidemiological biomarkers that may ultimately obviate the need for anyone to actually acquire a disease or die to allow inferences about the causes of disease or effectiveness of new interventions. Bridging the gap between population sciences and laboratory sciences is one of the major responsibilities of schools of public health.

Resolving the dilemma of prevention versus treatment

While it has been a truism that public health has emphasised the importance of disease prevention, whereas clinical medicine has tended to focus on treatment, with the



development of modern biomedical sciences, that artificial dichotomy is being blurred, or perhaps transcended by a variety of health promoting activities. An example: from 1968 to 2000, deaths from heart disease in the United States have fallen by 68% and a comparable reduction between 1950 and 2000 has been achieved in deaths from strokes (National Institutes of Health/National Heart, Lung and Blood Institute. 2000). When detailed research was carried out on how much of that reduction was due to 'primary prevention' - that is, change in diet, exercise, and unhealthy behaviour and how much to anti-hypertensive medicines, the results were very striking: primary prevention explained only 25% of the reduction, and preventive therapy with anti-hypertensive drugs was responsible for 71% of the reduction (Hunink et al. 1997).

There is, of course, a danger from the human genome project that the rich countries will devote vast resources to identifying genetic risks for individuals, perhaps even from birth, and create a kind of 'boutique medicine', using

'designer tailored' drugs to prevent and treat diseases resulting from individual risks. This approach has the sinister potential to increase the disparities between rich and poor, within and between countries. But the genome also offers tremendous possibilities for designing vaccines and drugs against common targets in chronic diseases that could be used on a population-wide basis, just as aspirin is currently used in industrialized countries to prevent strokes and heart attacks. There is a clear need for exploring population-based preventive treatment. Two examples among many come to mind: treatment of depression with anti-depressive drugs with limited adverse effects; and treatment of hypertension with anti-hypertensive drugs that could be used safely on a population basis in developing countries.

Thus the distinction between 'prevention' and 'treatment' will become increasingly blurred, and the need for collaboration between public health and clinical medicine will become more important and a more powerful force in preventing illness. This continuum will require a greater



Boston University School of Public Health Department of International Health Certificate Courses

- Managing Disasters and Complex Humanitarian Emergencies
- Summer Certificate Program in International Health
- Management and Finance for International Health

12-week intensive courses for the health professional; each provides 16 credits towards the Master of Public Health degree at Boston University.

Competitive partial tuition scholarships are available

Contact Sarah Petty at 617/638-5234 or ih@bu.edu. Please reference Global Forum when inquiring about courses. Visit us online at http://www.bu.edu/dbin/sph/departments/international_healthacademic_programs.php

integration of knowledge and training in schools of public health and medicine.

Resolving the dilemma of population versus the individual

In most countries it is assumed that health is an individual responsibility. But if one considers the major known risks for disease, it becomes clear that many are primarily behavioural and not intrinsically biological: tobacco use, inadequate diet, lack of exercise, unsafe sex, injuries, etc. The question is why medicine and public health have been so ineffective in improving health behaviours. Neuroscientists know that nicotine in tobacco is the most highly addictive substance known, and those social interventions, raising the price of cigarettes and stopping advertising, are the most effective means to prevent young people from becoming addicted. There are plentiful data that indicate that income disparities correlate with health disparities, and that even when a community lives well above the level of absolute poverty, its richer members are healthier than its relatively poorer members. Thus health status is correlated with economic status, and those with poorer health are more likely to have experienced educational and social disadvantages (Marmot, 2001).

Cultural differences between groups play an enormous role in health status. Even in countries in Africa where governments now provide free HIV/AIDS testing, counseling, and antiretroviral treatment, only about a third of patients who could benefit take advantage, the major barrier being 'stigma'. Around the world, families are having fewer children, partly because their chances of survival are now greater with better healthcare and immunisation, but also because of the diffusion of ideas and acceptance of smaller family sizes. Jane Menken has pointed out that 'People change the way they think because other people around them are changing their ideas'. The bottom line is that our health is not simply an individual responsibility, but is greatly patterned by social determinants and context. That is the basis for all advertising. It is important for public health to provide training in behaviour and social determinants of health. The big research challenge is to develop social interventions that will change societal patterns of unhealthy behaviour and promote healthy ones.

Health disparities

The common thread that links the various domains that constitute schools of public health together - epidemiology, statistics, laboratory sciences, nutrition, environmental health, maternal and child health, international health, social and behavioural determinants of disease, health policy and health systems, - is a shared commitment to reduce the health disparities within and between populations and to create interventions that increase health equity. The population-based focus of public health and disease prevention is often the only hope that poor and disadvantaged people who do not have adequate access to medical services have to look to for a better life. These disparities are not easily rectified by one-on-one transactions between doctors and their patients. They are reflective of broader disparities in society that clearly cannot be solved fully by health

interventions alone. But we do know that they can be reduced by population-based preventive interventions, which is what public health, when adequately supported politically and financially, can do best.

The economic impact of public health

Historically, public health interventions have had greater returns than almost any other investments in society. It is estimated that 30% of the per capita economic growth rate in Britain between 1780 and 1979 was due to improvement in health and nutritional status (Fogel, 1997). If we look at the global picture, as illustrated in the World Bank's *World Development Report 1993, Investing in Health* (World Bank, 1993), we can draw several intriguing conclusions, as Figure 1 shows.

The figure demonstrates that, if one is poor, the likelihood of dying at a relatively young age is greater than for someone with greater purchasing power, while relatively small increments in income can have very significant impacts on health and life expectancy. It also shows that the greatest gains in life expectancy occurred in the first half of the century, before there were miracle drugs and surgery, so that the gains must be largely attributable to public health. Finally it shows that, even if one had all the money in the world, there was something that could not be bought for any price in 1900, which by 1990 could be bought for US\$5,000 PPP – that is 25 years of life. What one could not buy in 1900 is the knowledge of public health and biomedical science. And that is where schools of public health have an essential role.

In contemporary terms, estimates are that the economic costs of SARS, which caused about 8,000 cases and 774 deaths in 29 countries, represented between US\$16-30 billion lost just to the Asian economies. The direct and indirect costs of HIV/AIDS not only in lives tragically lost, but in sustainable development are inestimable, and the potential impact on economic growth in India and China, if it is not kept under control, is of enormous concern.

In sum, the generation and application of new knowledge accounts for approximately half of all health gains worldwide over the past 50 years (World Bank, 2000).

The growth rates of the East Asian economies between 1965–1990 are among the most rapid ever described. Recent studies have revealed that the initial decline in infant and child mortality in Southeast Asian countries created a bulge in a productive youth population – the 'demographic gift', i.e. the children under five who did not die, but survived and received an education – which explains perhaps one-third of the 'economic miracle' experienced by the East Asian 'tigers' (Bloom and Williamson 1998). Health now represents 8% of the global economy, and both public demand and new drugs and interventions are likely to increase costs of medical care. Yet public health represents only a minute fraction of all global and domestic health-related expenditures.

The greatest needs in developing countries

The 1996 WHO Ad Hoc Committee Report emphasised three

needs that had not previously been emphasised as essential to development (WHO Ad Hoc Committee, 1996). The first was a need for new knowledge through research to develop new tools with which to address the continually emerging global health problems. Some of this knowledge will be public knowledge, but much will be context-specific and country specific. The second was the recognition that in many developing countries, capacity - people with training to carry out surveillance, laboratory and operational research - are limiting, and there is an enormous need for training. There is also a need for career structures and incentives to retain professionals with training in public health, medical sciences and health systems within developing countries. Finally, both of those are dependent on the strengthening of institutions universities, schools of public health and medicine, centres for disease control, health policy and economic research institutions. If one recognises how few high level institutions for research and training in public health have been created over the past 25 years in developing countries, it will not be surprising how desperate are the capacity and infrastructure needs in public health in developing countries. For this situation to improve in a timely way, ideally there will be a need for new public and private commitments and partnerships, and support for linkages between institutions in the developed and the developing world to reduce the public health capacity gap between rich and poor countries.

Public health as a global public good

In a world of globalisation of diseases as well as economies, there is nowhere on the planet that is remote and no one from whom we are totally disconnected. No country, however rich, can insulate itself from the rest of the world, nor avoid the risks of emerging infectious diseases. And there is no country in which health expectations and costs are not rising.

Public health schools are critical to the development of knowledge and information about health of populations and countries. Knowledge in public health represents a global 'public good'. These are goods that possess two special properties: i) non-exclusivity, that is, when supplied, they do not require payment of fees or price to benefit individuals or groups, as, for example, in the benefit to the world community by the elimination of smallpox; and ii) non-rivalry, that is, the use of the benefits by an individual, group or country will not diminish the benefit of others from the same good or service. The economist, Dean Jamison has stated that 'Knowledge about disease prevention, good surveillance for infectious diseases, the lessons from intervention research, sharing of health data, and the development of new products such as vaccines – all are public goods'.

Perhaps the clearest statement of the common values underlying public health is expressed in the Preamble to the Constitution of the World Health Organization: 'The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social conditions.'

Barry R Bloom is Dean of the Harvard School of Public Health. He has been extensively involved with WHO for more than 30 years and is a member of the WHO Global Advisory Committee on Health Research as well as Chair Emeritus of the International Vaccine Institute. An immunologist with a special interest in the immune response to tuberculosis, Dr Bloom received the first Bristol-Myers Squibb Award for Distinguished Research in Infectious Diseases. He shared the Novartis Award in Immunology in 1998, and received the Robert Koch Gold Medal in 1999. He is a member of the National Academy of Sciences, the Institute of Medicine and the American Academy of Arts and Sciences.

Acknowledgement: The author thanks Rick Friedman for the photograph.

References

Bloom, DE, and Williamson, JG, 1998. World Bank Economic Review: 12:419-455.

Fogel, RW, 1997. In Rosenzweig, MR and Stark, O, eds, Handbook of population and family economics Vol. 1A, Elsevier Science, Amsterdam, pp433-481.

Frenk, J, 2004. In Bloom, BR and Brown, P. The Future of Public Health. Distributed by Harvard School of Public Health, Cambridge.

Gebbie, K, Rosenstock, L and Hernandez, L.M. Eds, 2003. Who Will Keep the Public Healthy?: Educating Public Health Professionals for the 21st Century. Institute of Medicine, US National Academy Press.

Hunink, MGM, et al, 1997. 'The recent decline in mortality from coronary heart disease, 1980-1990. The effect of secular trends in risk factors and treatment.' JAMA 277:535-542.

Marmot, M, 2001. 'Inequalities in health.' New England Journal of Medicine, July 12; 345: 134-136.

Michaud, CM, et al, 2001. 'Burden of disease - implications for future research'. JAMA 285(5): 535-539.

Murray, C, and Lopez, A, eds, 1996. The Global Burden of Disease. Harvard School of Public Health/World Health Organization/World Bank. Harvard University Press. Cambridge.

National Institutes of Health/National Heart, Lung and Blood Institute. 2000. Morbidity and Mortality Chartbook 2000. See www.nhlbi.nih.gov/resources/docs/cht-book.htm

PAHO, 2002. Mapping Competencies for Communication for Development and Social Change: Turning knowedge, Skills, and Attitudes into Action. PAHO, Rockefeller Foundation, The CHANGE Project/ USAID.

WHO Ad Hoc Committee on Health Research Relating to Future Intervention Options. 1996. World Health Organization, Geneva.

World Bank, 1993. World Development Report: Investing in Health. Oxford Univ Press.

World Bank, 2000. World Development Report 2000/2001. Attacking Poverty. Oxford Univ. Press.

World Health Organization, 2000. The World Health Report 2000; Health Systems: Improving Performance. WHO, Geneva,

World Health Organization, 2002. World Health Report, 2002. Reducing Risks to Health, Promoting Healthy Life. WHO. Geneva.

Capturing biotechnology's promise for developing world diseases



Article by Wendy Taylor

ver the past decade, biotechnology has grown into a global industry with far-reaching promise – and global responsibilities. With its cutting-edge vaccines, therapies, diagnostics, and delivery tools, biotechnology holds the key to solving many of the world's most devastating health problems. However, while there are a surprising number of far-sighted industry leaders who want to tackle neglected diseases such as HIV, tuberculosis, malaria and diarrhoeal diseases, product research and development in these areas remains limited. As a result, the potential for biotechnology in developing countries has gone largely untapped. A complex web of market, funding and information barriers have prevented the biotechnology industry from playing a significant role in the fight to improve global health.

BIO Ventures for Global Health (BVGH), which was recently spun out of the Biotechnology Industry Organization (BIO) with initial support from the Bill & Melinda Gates and Rockefeller Foundations, has been formed to break these barriers. To bridge the promise of biotechnology with the enormous unmet health needs of the developing world, many more biotech companies must be enlisted in the fight against neglected diseases, and their products need sufficient funding and assistance to advance. BVGH's approach is market-based and founded on the belief that economic mechanisms are a critical driver for broad industry involvement.

Biotechnology as a solution

Biotechnology has revolutionised medicine in industrialised countries, leading to the discovery and development of new drugs for heart disease, cancer, neurological conditions and infections. Biotech products approved by the US Food and Drug Administration (FDA) have helped more than 325 million people worldwide, and 70% of the biotech drugs and vaccines on the market were approved in just the last six years (BIO, 2003).

Analysts agree that the industry is at the beginning of a technology curve where the potential appears nearly limitless (Ernst and Young, 2004). With the sequencing of the human genome and new maps detailing millions of genetic variations, scientists have a wealth of new data about the fundamentals of health and disease. A steady stream of new biotech products that are more effective and have fewer side effects are expected in the coming decades. In fact, in the

United States, over 370 drug products and vaccines are currently in clinical trials targeting over 200 diseases (BIO, 2004). The burgeoning growth of biotech sectors in places such as Asia, South Africa and Brazil will accelerate progress and further the industry's successes.

As part of these technological advances, biotechnology offers powerful new tools in the fight against the world's toughest neglected diseases - tools that can lead to new treatments and vaccines, rapid diagnostics, and alternative delivery mechanisms that break the cold chain. A 2002 World Health Organization (WHO) report, Genomics and World Health, cited growing evidence that better knowledge of the genomics of pathogens and their vectors, if developed and deployed, could improve the lives of millions of people in the developing world (World Health Organization, 2002). That same year, a seminal report published by the University of Toronto Joint Centre for Bioethics identified the ten most promising biotechnologies for improving global health in the next five to ten years, reinforcing the critical role biotechnology can play in addressing developing world diseases (Daar et al. 2002).

The potential application of these technologies for the developing world is truly enormous. Not only can biotech improve upon conventional approaches, leading to improved and novel vaccines, treatments and diagnostics, many of these new technologies can be adapted to overcome public health infrastructure constraints in resource-poor settings.

For example:

- Recombinant vaccines can be safer, more effective and potentially cheaper.
- Vaccine delivery technologies include alternatives to injections (such as powdered vaccines, skin patches, oral vaccines and edible vaccines) that can reduce the need for trained personnel, needles and refrigeration.
- ➡ Biotech-based diagnostics can be faster, more accurate and cheaper, allowing for easier interpretation of results and improved health care delivery (e.g. as disposable, hand-held tests that provide results in minutes, eliminating the need for expensive lab equipment; diagnostic technologies that do not rely on sterile conditions or high-tech labs; and easy-to-interpret colour tests that eliminate the need for technically trained personnel).

Technology	Developing world need	Biotech solution	Examples
Molecular Diagnostics	Many diagnostics used today in developing countries require expensive lab equipment and highly trained personnel, and are time-consuming and expensive.	Biotechnology-based diagnostics can be cheaper, faster and more accurate; improve healthcare delivery; and allow for easier interpretation of results eliminating the need for technically trained personnel, expensive lab equipment or costly facilities.	 Disposable, hand-held HIV tests that can be used at point of care. Diagnostic technologies that do not rely on sterile conditions or high-tech labs. Easy-to-interpret color tests that eliminate the need for highly trained personnel.
Recombinant Vaccines	Vaccines are a key component to disease management but there are still many infectious diseases without an effective vaccine.	Biotech-based vaccines (e.g. subunit vaccines, genetically attenuated vaccines, viral vector vaccines, bacterial vector vaccines, naked DNA vaccines and edible vaccines) can be safer, more effective and cheaper than conventional vaccines.	Subunit vaccines for hepatitis B, whooping cough, and meningitis B are in use today. Naked DNA approaches are being used in development of vaccines for HIV, malaria and Leishmania (in clinical trials) Research on edible vaccines includes diseases focused on infant diarrhea (Norwalk virus, Vibrio cholerae, enterotoxic E. coli), hepatitis B, measles, and human papilloma virus.
Vaccine Delivery Technologies	Current methods of vaccine delivery rely largely on refrigeration, trained personnel, and disposable needles.	Biotechnology offers a range of new solutions to get around many of the existing problems with vaccine delivery. Current alternatives to injections include powdered vaccines, skin solutions, skin patches, oral vaccines and edible vaccines.	 A vaccine skin patch that is easy to use and does not require refrigeration (vaccines for ETEC, tetanus, and H. pylori under development) Needle-less powder injection (vaccines for infant diarrhea, yellow fever and TB are already available). Oral polio vaccine available. Edible vaccines (e.g. hepatitis vaccines in bananas and E. coli and cholera vaccines in potatoes under development).
Sequencing pathogen genomes	New drug and vaccine targets to address developing world diseases are needed	Sequencing the genomes of human pathogens helps scientists better understand how diseases work, how organisms develop drug resistance and methods for effective treatment and prevention. Tools such as bioinformatics are then used to analyze the genetic sequences to identify proteins that could play an important role in drug and vaccine discovery.	Numerous vaccine candidates for a particularly virulent strain of meningitis, a potentially fatal bacterial infection, were discovered by Italian researchers using basic bioinformatics tools. Of the 570 antigens they found, 85 showed promising results when used to immunize mice. The sequencing of the plasmodium genome has helped identify and validate new malaria drug targets.

^{*} Compiled from the University of Toronto Report, Top 10 Biotechnologies for Improving Health in Developing Countries, WHO Genomics and World Health Report 2002, and BVGH sources

Table 1: Examples of biotechnology innovations for global health

New drug delivery mechanisms, including combination or controlled-release formulations, can improve drug compliance.

Biotech also provides a set of powerful and flexible tools to advance research and product development such as the rapidly evolving fields of genomics and proteomics. These new technologies are helping researchers understand the mechanisms of disease and identify new drug and vaccine targets. For example, companies are using high throughput proteomic screening to identify antigens for new vaccines against infectious diseases such as tuberculosis (see Table 1).

Given the industry's willingness to approach niche markets and their demonstrated record as an important source of new technology and innovation, the possibilities for improving the overwhelming morbidity and mortality caused by these diseases are extremely promising.

Biotechnology is beginning to reach the developing world

A number of companies are working to tackle diseases of the developing world, and many others have expressed a real desire to do so if the appropriate economic incentives are in place. BVGH has been mapping the pipeline for neglected diseases and has already identified over 130 companies pursuing product development for neglected diseases.

There also are some early successes. A number of useful biotechnology applications for the developing world have already been realised. For example:

- recombinant vaccines for hepatitis B and meningitis B are being distributed, and in some cases even manufactured, in the developing world;
- Powderject Pharmaceuticals Plc, now owned by Chiron, developed a needle-less powder injection, with vaccines for infant diarrhoea, yellow fever and tuberculosis now available
- Abbott Diagnostics has used recombinant antigens in a simple, handheld test device that provides an accurate HIV diagnosis in minutes and has successfully field tested the product in Ghana (Singer and Daar, 2001).

A number of companies are working to tackle diseases of the developing world, and many others have expressed a real desire to do so if the appropriate economic incentives are in place. BVGH has been mapping the pipeline for neglected diseases and has already identified over 130 companies pursuing product development for neglected diseases

Barriers are significant

While a growing number of companies are actively looking for solutions to the complex and difficult challenge of neglected disease product development, the barriers impeding such work are substantial. Many of these companies have the technologies, tools and desire to respond, but few can.

The challenge of engaging in neglected disease product development cannot be underestimated. Companies face significant market, funding and information barriers that have impeded scientific progress and precluded industry involvement.

Biotech companies rely heavily on external sources of funds to finance their research and development agendas. The global market even in good economic times has difficulty supporting the nearly 5,000 public and private companies throughout the world which, viewing the sector as a whole, have never been profitable (Ernst and Young, 2004a). Attracting the necessary capital to pursue products targeted toward developing world diseases is particularly difficult given the limited purchasing power of developing countries and the poor expected return on investments. As a result, traditional sources of financing for biotech companies, namely venture funds, are unavailable for global health projects leaving a critical gap in funding.

In addition, these diseases are still not well understood, the science is complex, and the prospect of discovering a successful new treatment or vaccine remains risky. For every five product candidates that enter clinical trials, only one will emerge successfully. This combination of high market risk and high technology risk leaves companies few financing options - primarily government grants or a handful of disease-specific public-private partnerships - forcing many to shelve promising leads for such products.

Companies face additional hurdles developing products in uncertain markets where they have limited or no experience or sufficient market information. Most lack information on the existing market opportunity for these products or how to get products tested, licensed and distributed in these countries. The prevailing assumption is that developing world markets are simply not viable. Certainly, weak public health infrastructure in many of these countries makes it difficult to test lead drugs and vaccines in clinical trials or get successfully developed products to those that need them. And navigating multiple regulatory systems to pursue product registration in disease-endemic regions presents a host of complex challenges (Kettler, 2002). But overall, the business case has not been explored - and companies currently have little incentive to expend any effort to do so. A better understanding of how to identify the market opportunity and navigate these difficult paths can reduce many of the hurdles to development and distribution and improve the value proposition for companies.

A novel approach

BVGH has adopted a novel approach to tackle these difficult challenges. BVGH understands that to bring biotechnology companies – particularly the most experienced companies – into the challenge of tackling global health problems, the financial incentives must be strong enough to compete with other product opportunities. And companies must see a clear pathway to get developing world products tested, licensed and distributed to patients that need them.

Since companies have little current incentive to gather this information for developing world markets, BVGH plans to fill

that void. With better market information, new models for tapping into emerging markets, and more credible and predictable developing world markets, BVGH can improve the value proposition for companies to pursue developing world products.

BVGH will begin its work in two key areas. Through the development of a series of product-specific business cases, BVGH will identify viable market opportunities and map the clinical, regulatory and distribution strategies to get successful products to those who need them most. This information will provide biotech companies the tools they need to develop business cases around their own technologies and evaluate the potential market opportunities.

The value of these business cases, however, extends beyond individual companies. Not all of these business cases will yield viable market opportunities. BVGH will use the information to identify areas where alternative mechanisms are needed to improve - or create - the market opportunity for specific products and 'pull' greater industry involvement. BVGH is continuing to work with industry and the global health community to identify economic incentives to enhance or create credible and predictable markets for developing world products, including the use of donor-sponsored advance purchase contracts that can guarantee a market for successful products.

BVGH is unique among public-private partnerships because of its strong ties to BIO and the biotech industry.

With full access to BIO's extensive tools, resources and networks - including licensing, partnering, regulatory and financial opportunities - BVGH is working to build effective collaborations between the public and private sector and enlist the creativity, energy and skills of the biotech industry in the fight against neglected diseases.

But BVGH and the biotech industry cannot do any of this alone. Partners across the public and private sectors must join together to tackle these problems. The need for successful products, credible buyers and viable distribution channels are all interdependent and require progress in each of these areas concurrently if we ever hope to bring the enormous potential of this industry to patients in the developing world.

Wendy Taylor is the Executive Director of BIO Ventures for Global Health. Currently, she is directing the overall strategy and implementation of BVGH. Previously, she was the Director of Regulatory Affairs and Bioethics for the Biotechnology Industry Organization (BIO) where she spearheaded BIO's global health initiative, launching the first Partnering for Global Health Forum sponsored by BIO and the Bill & Melinda Gates Foundation and creating the business platform for BVGH. Ms Taylor has extensive experience in the executive and legislative branches of the U.S. government, including positions at the Office of Management and Budget (OMB), the US Department of Health and Human Services and the US House Committee on Ways and Means.

References

BIO, 2003. Editors' and Reporters' Guide to Biotechnology 2004. The Biotechnology Industry Organization. June 3, 2003. Available at: http://www.bio.org/speeches/pubs/ last accessed 2 September 2004.

BIO, 2004. See: http://www.bio.org, last accessed 2 September 2004.

Daar, A.S., H. Thorsteinsdøttir, D.K. Martin, A.C. Smith, S. Nast, and P.A. Singer. 2002. Top Ten Biotechnologies for Improving Global Health. Report of the Joint Center for Bioethics, University of Toronto, Toronto, Canada, 2002.

Ernst and Young. 2004. The Global Biotechnology Reports 2004. Beyond Borders: A global perspective. Available at:

http://www.ey.com/global/content.nsf/International/Overview_2004 Biotech nology Reports Beyond Borders, last accessed 2 September 2004.

Ernst and Young 2004a. The more than 600 publicly traded biotech companies across the world had a 2002 net loss of more than \$12 billion. Of the 4,300 privately held entities across the globe, the vast majority are loss-making enterprises. Ernst and Young Global Pharmaceutical Report 2004. Available at:

http://www.ey.com/global/content.nsf/International/Progressions:_Global_Ph armaceutical_Report_2004, last accessed 2 September 2004.

Kettler, H, 2002. Biotechnology for Global Health: An Options and Feasibility Study. Institute for Global Health. August, 2002.

Singer, PA and Daar, AS, 2001. 'Harnessing genomics and biotechnology to improve global health equity'. Science 294:87-89.

World Health Organization, 2002. Genomics and World Health. Report of the Advisory Committee on Health Research. World Health Organization, Geneva.

Advertisers and sponsors' index

Boston University School of Public Health	174
DHL	158-160
Global Alliance for Improved Nutrition	132
IDRC	42
International AIDS Vaccine Initiative	84
John Snow, Inc	137
Johns Hopkins Bloomburg School of Public Health	170
Keele University	172
Lilly	IFC
Microsoft	152-153
Norad	6
Novo Nordisk	88, 100-103
Pfizer	4
WHO Special Programme for Research and Training in Tropical Diseases	2
ZonMw	64-66

To advertise in or sponsor the *Global Forum Update on Health Research* please contact Pro-Brook Publishing on +44 (0)207 863 3353

Acknowledgements

The publishers hereby acknowledge the assistance of all the contributors who have helped in the production of the publication and the advertisers and sponsors who have made publication possible.

They would also like to thank the following:

Stephen Matlin, Editor Richard Feacham, Chairman of Editorial Board Susan Jupp, Global Forum for Health Research Stephen Kemp-King, Pro-Brook Publishing Simon Marriott, Art direction Commercial Colour Press Plc, Printer Forgarty International Center, donation Mexican Museum of Anthropology, Mexico, illustration

Notes